

**WCT Series Cooling Tower  
Conductivity Controller  
Instruction Manual**

## **Notice**

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## 1.0 INTRODUCTION



The Walchem WCT300 Series controllers offer conductivity control of cooling tower water, control of corrosion/scale inhibitor feed, and with the WCT310 models, control of two biocide pumps. The inhibitor pump may be selected to operate in one of the following modes:

- Feed and Bleed
- Feed and Bleed with Lockout
- Feed as a percent of Bleed
- Feed as a percent of Time
- Feed based on a Water Contactor input

The WCT series cooling tower controllers are supplied with a temperature compensated carbon probe with a cell constant of 1.0. The controllers are microprocessor driven industrial type with on/off control outputs. A timed sample mode may be selected, and on small towers can reduce installation costs by eliminating the need for a sampling bypass line. An optional isolated 4-20 mA output that is proportional to the conductivity reading is available for all models.

Any set point may be viewed without interrupting control. Each set point change will take effect as soon as it is entered. An access code is available to protect set point parameters, while still allowing settings to be viewed.

The model WCT310 biocide outputs are scheduled on a user selectable 1, 2, or 4 week cycle. Each biocide output is independent and may be programmed for one add per day. (in 1, 2 or 4 week cycle) or up to 10 times per day (in daily cycle). It is possible to add both chemicals in the same day, however, as a safeguard they will not occur at the same time. Biocide outputs may use independent pre-bleeds and lockout times. All outputs are interlocked with a flow switch input.

An alarm relay is provided with WCT310 models. It is triggered by:

- Low Conductivity reading
- High Conductivity reading
- No Flow situation
- Bleed Timeout
- Sensor Error
- Temp Error

## 2.0 SPECIFICATIONS



### 2.1 Measurement Performance

Conductivity Range:	0 - 10,000 $\mu\text{S}/\text{cm}$ (microSiemens/centimeter)
Conductivity Resolution:	1 $\mu\text{S}/\text{cm}$
Conductivity Accuracy:	10 - 10,000 $\mu\text{S}/\text{cm}$ $\pm 1\%$ of reading 0 - 10 $\mu\text{S}/\text{cm}$ $\pm 20\%$ of reading
Temperature Range:	32 - 158°F (0 - 70°C)
Temperature Resolution:	0.1°C
Temperature Accuracy:	$\pm 1\%$ of reading

### 2.2 Electrical: Input/Output

#### *Input Power*

110-120 VAC	or	220-240 VAC
50/60 Hz, 10A		50/60 Hz, 5A

#### *Input Signals*

Conductivity electrode:	1.0 cell factor, 10K thermistor
Flow Meter (optional):	Isolated, dry contact closure required (i.e., relay, reed switch)
Flow Switch (optional):	Isolated, dry contact closure required (i.e., reed switch)

#### *Outputs*

Mechanical Relays:	Pre-powered on circuit board
	@ 120 VAC                      @ 240 VAC
	10 A resistive                      5 A resistive
	1/8 HP                                      1/8 HP
4 - 20 mA (optional):	Internally powered
	Fully isolated
	600 Ohm max resistive load
	Resolution .001% of span
	Accuracy $\pm 1\%$ of reading

#### *Agency Approvals*

UL	ANSI/UL 61010-1:2004, 2 <sup>nd</sup> Edition*
CAN/CSA	C22,2 No.61010-1:2004 2 <sup>nd</sup> Edition*
CE Safety	EN 61010-1 2 <sup>nd</sup> Edition (2001)*
CE EMC	EN 61326 :1998 Annex A*

Note: For EN61000-4-6,-3 the controller met performance criteria B.

\*Class A equipment: Equipment suitable for use in establishments other than domestic, and those directly connected to a low voltage (100-240 VAC) power supply network which supplies buildings used for domestic purposes.

### 2.3 Mechanical

Enclosure Material:	Fiberglass
NEMA Rating:	NEMA 4X
Dimensions:	8.5" x 6.5" x 5.5"
Display:	2 x 16 character backlit liquid crystal
Operating Ambient Temp:	32 - 122°F (0 - 50°C)
Storage Temperature:	-20 - 180°F (-29 - 80°C)

Graphite electrode pressure rating 150 psi  
 Stainless steel electrode pressure rating 150 psi  
 Flow switch manifold pressure rating 150 psi  
 High pressure electrode flow switch manifold pressure rating 300 psi  
 Flow switch manifold connections ¾" NPTF

### 2.4 WCT Variables and their Limits

	Low Limit	High Limit
Conductivity menu		
PPM Conversion Factor (ppm/μS/cm)	0.200	1.000
Interval Time (sampling)	5 minutes	24:00 hours
Duration Time (sampling)	1 minute	59 min: 59 sec
% Calibration Range	-50	+50
Temperature Menu		
No variables		
Bleed Menu		
Set Point	0 μS/cm	10,000 μS/cm
Dead Band	5 μS/cm	500 μS/cm
Bleed Time Limit (set in hrs/minutes)	1 minute	8hrs: 20 min (enabled) Unlimited (disabled)
Feed Menu		
Feed Lockout Timer (Mode A)	1 second	99 min: 59 sec
Percent of Bleed (Mode B)	5%	99%
Feed Time Limit (Mode B)	1 minute	99 min: 59 sec
Percent of Time (Mode C)	0.1%	99%
Feed Cycle Time (Mode C)	10 minutes	59 min: 59 sec
Time per Contact (Mode D)	1 second	59 min: 59 sec
÷ Contacts by (Mode D)	1 contact	100 contacts
Time Limit (Mode D & E)	1 minute	99 min: 59 sec
Time/Vol (Mode E)	1 second	59 min: 59 sec
Vol to Initiate Feed (Mode E)	1	9,999
K factor (Mode E)	1 pulse/vol	20,000 pulses/vol

## 2.4 WCT Variables and their Limits (continued)

Totalizer	Gallons per Contact	1 gal/contact	500gal/contact
	Liters per Contact	1 L/contact	500 L/contact
Biocides	Pre-Bleed	1 $\mu$ S/cm	9.999 $\mu$ S/cm 0 disables pre-bleed
	Lockout Add Time	0 minutes	9 hrs: 59 min
	Daily Adds	0 minutes	144 minutes
	All other modes	0 minutes	1440 minutes
mA	4 & 20 mA Settings	0 $\mu$ S/cm	10,000 $\mu$ S/cm
Access Code	New Value	0	9999
Alarms	High & Low (Set to zero to disable)	1%	50%

*Note:* The Alarm relay is non-programmable. Refer to the Main Menu diagram on page 16 for the list of error conditions that trigger the alarm relay.

## 3.0 UNPACKING & INSTALLATION



### 3.1 Unpacking the unit

Inspect the contents of the carton. Please notify the carrier immediately if there are any signs of damage to the controller or its parts. Contact your distributor if any of the parts are missing. The carton should contain: a WCT300 series controller and instruction manual. Any options or accessories will be incorporated as ordered.

### 3.2 Mounting the electronic enclosure

The WCT series controller is supplied with mounting holes on the enclosure. It should be wall mounted with the display at eye level, on a vibration-free surface, utilizing all four mounting holes for maximum stability. Use M6 (1/4" diameter) fasteners that are appropriate for the substrate material of the wall. The enclosure is NEMA 4X rated. The maximum operating ambient temperature is 122°F (50°C); this should be considered if installation is in a high temperature location. The enclosure requires the following clearances:

Top:	2" (50 mm)
Left:	8" (203 mm)
Right:	4" (102 mm)
Bottom:	7" (178 mm)

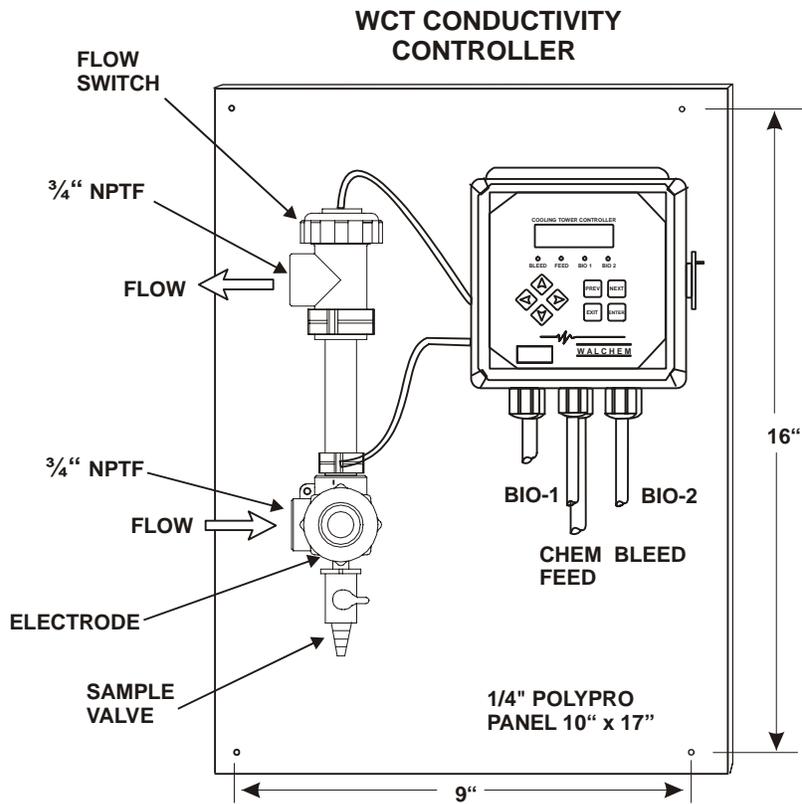
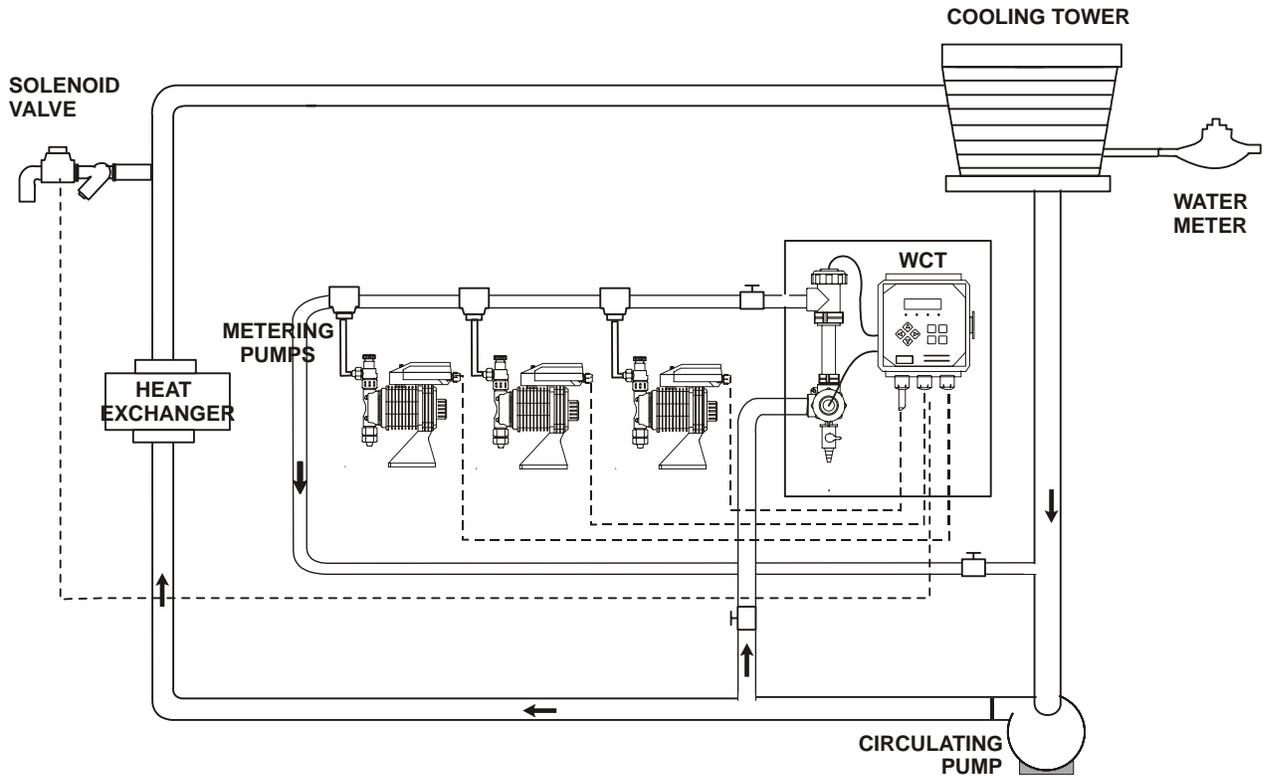
### 3.3 Installation

Once the WCT series controller is mounted, the metering pumps may be located at any distance from the controller. The conductivity probe should be placed as close to the controller as possible, to a maximum distance of 250 ft. Under 25 ft is recommended. The cable must be shielded from background electrical noise.

Always route low voltage (sensor) signals with at least a 6" separation from AC voltage wiring.

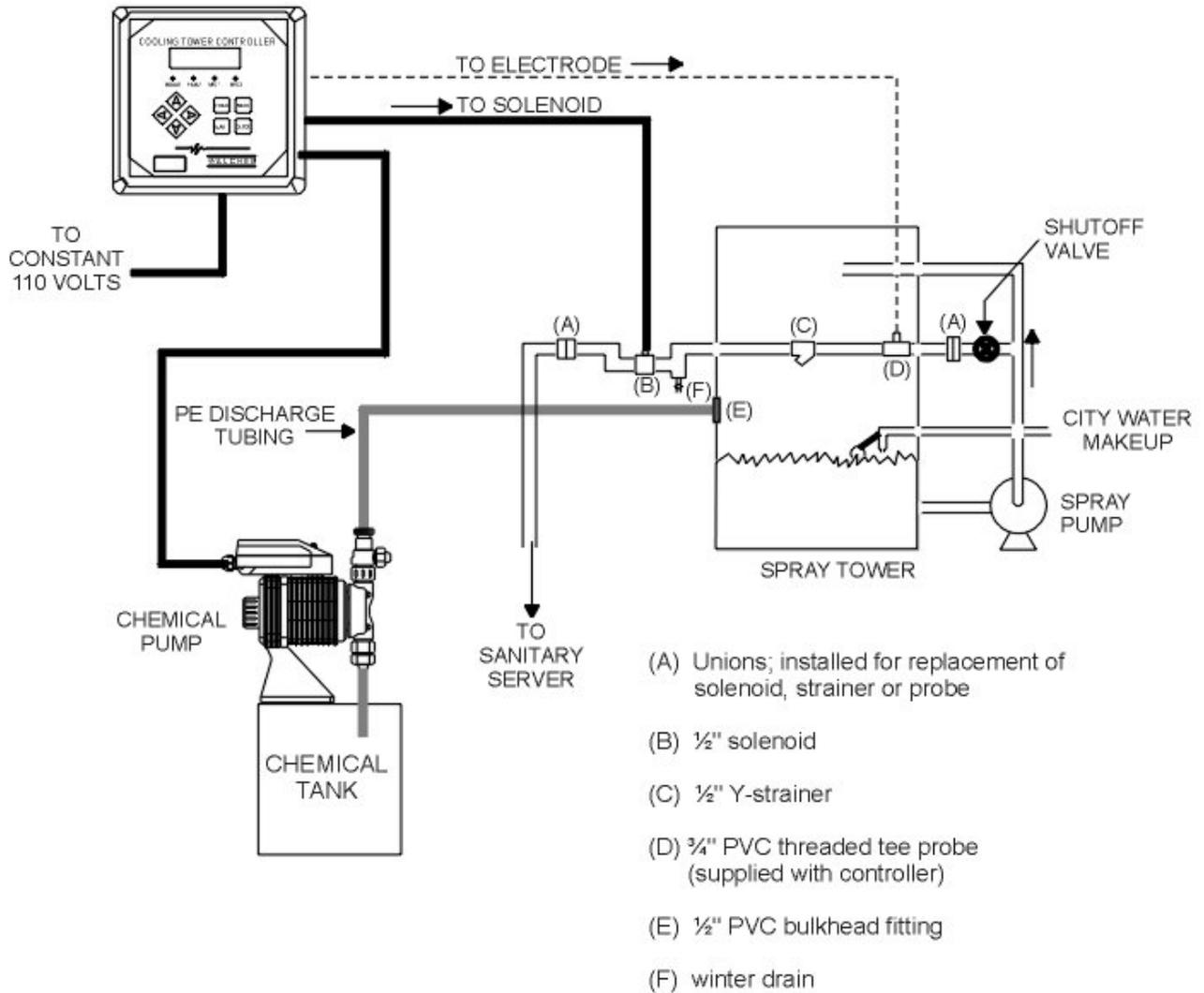
Locate the probe tee where an active sample of cooling tower water is available and where the probe can easily be removed for cleaning. It must be situated so that the tee is always full and the probe is never subjected to a drop in water level resulting in dryness. Refer to Figure 1 for typical installation.

**IMPORTANT:** To avoid cracking the female pipe threads on the supplied plumbing parts, use no more than 3 wraps of Teflon tape and thread in the pipe FINGER tight plus 1/2 turn! ***Do not use pipe dope to seal the threads of the flow switch because the clear plastic will crack!***



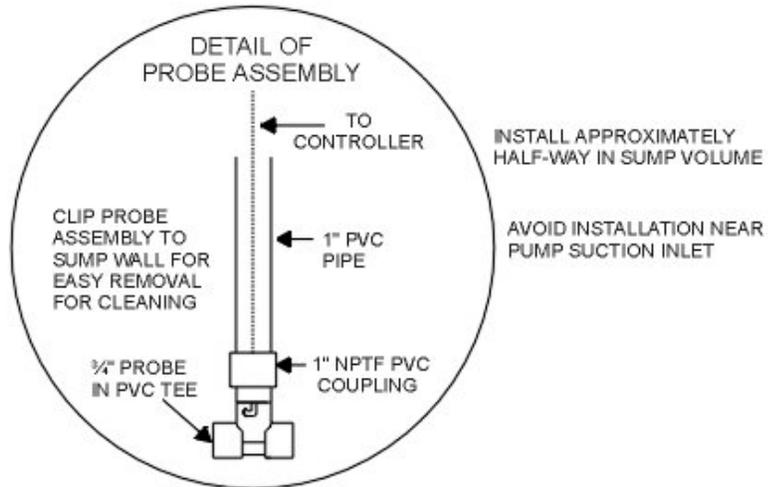
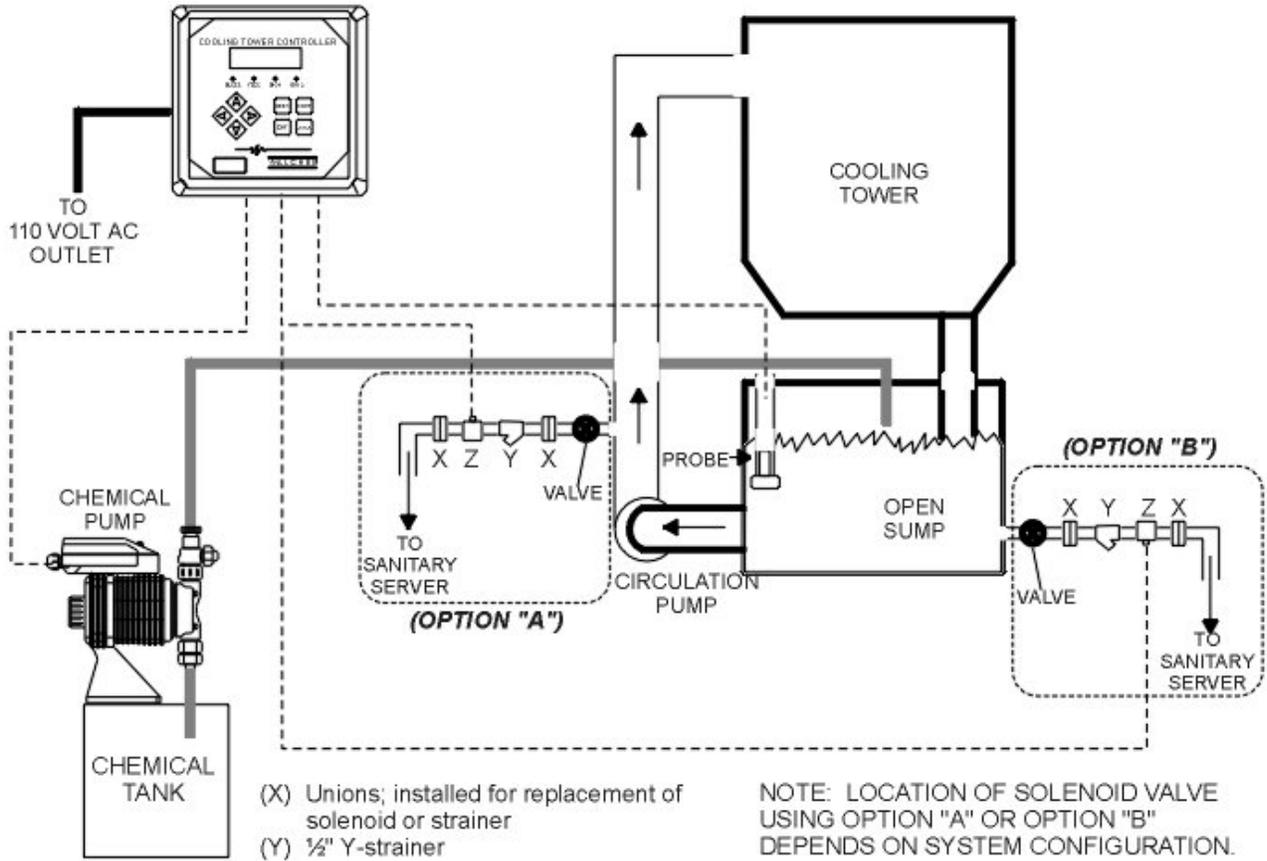
**Figure 1 Typical Installation**

## TYPICAL INSTALLATION INTERMITTENT SAMPLING



**Figure 1a Typical Installation  
Intermittent Sampling**

**TYPICAL INSTALLATION  
SUBMERSION ELECTRODE**



**Figure 1b Typical Installation  
Submersion Electrode**

### 3.4 Icon Definitions

Symbol	Publication	Description
	IEC 417, No.5019	Protective Conductor Terminal
	IEC 417, No. 5007	On (Supply)
	IEC 417, No. 5008	Off (Supply)
	ISO 3864, No. B.3.6	Caution, risk of electric shock
	ISO 3864, No. B.3.1	Caution

### 3.5 Electrical installation

Based on the model number, the following voltages are required:

WCT300-1xx	120 VAC, 50/60 Hz
WCT300-4xx	120 VAC, 50/60 Hz
WCT300-5xx	240 VAC, 50/60 Hz
WCT310-1xx	120 VAC, 50/60 Hz
WCT310-4xx	120 VAC, 50/60 Hz
WCT310-5xx	240 VAC, 50/60 Hz

The various standard wiring options are shown in figure 2. Your WCT series controller will arrive from the factory prewired or ready for hardwiring. Depending on your configuration of controller options, you may be required to hardwire some or all of the input/output devices. Refer to figures 3 and 4 for circuit board layout and wiring.

Note: when wiring the optional flow meter contactor input, the 4-20 mA output or a remote flow switch, it is advisable to use stranded, twisted, shield pair wire between 22-26 AWG. Shield should be terminated at the controller ground stud (see figures 3 and 4).



**CAUTION!** There are live circuits inside the controller even when the power switch on the front panel is in the OFF position! The front panel must never be opened before power to the controller is REMOVED!

If your controller is prewired, it is supplied with a 8 foot, 18 AWG power cord with USA style plug. A tool (#1 phillips driver) is required to open the front panel.



**CAUTION!** When mounting the controller, make sure there is clear access to the disconnecting device!



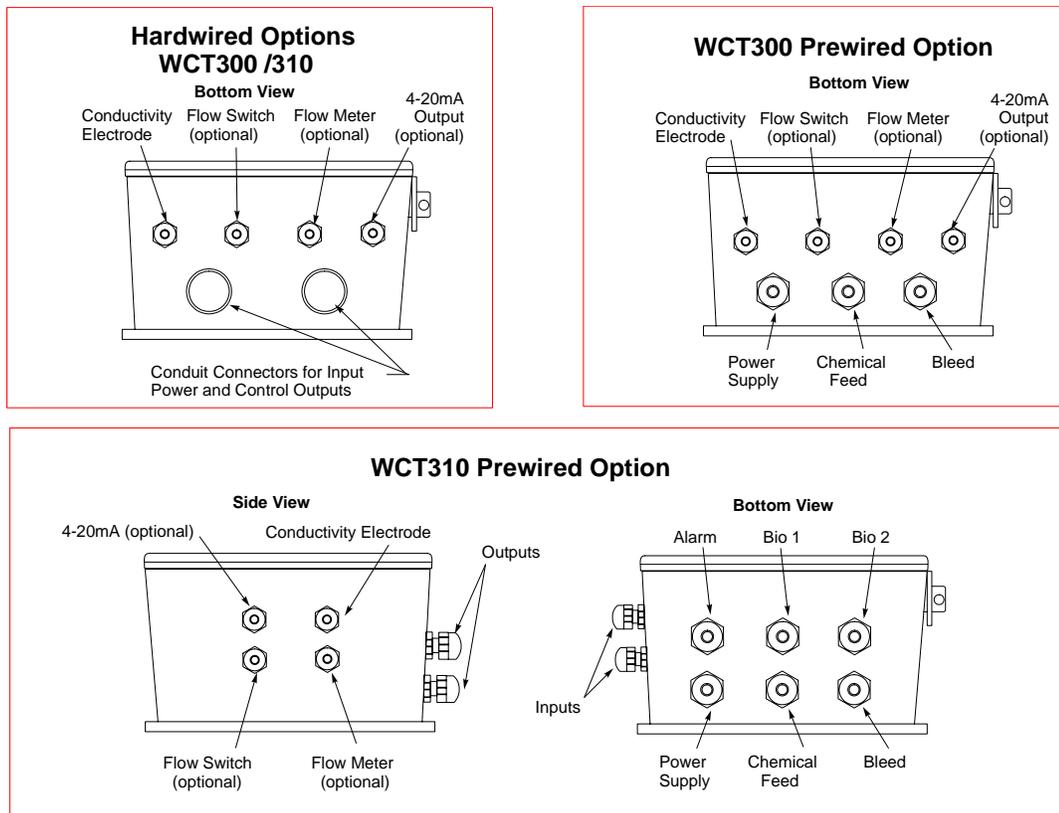
**CAUTION!** The electrical installation of the controller must be done by trained personnel only and conform to all applicable National, State and Local codes!



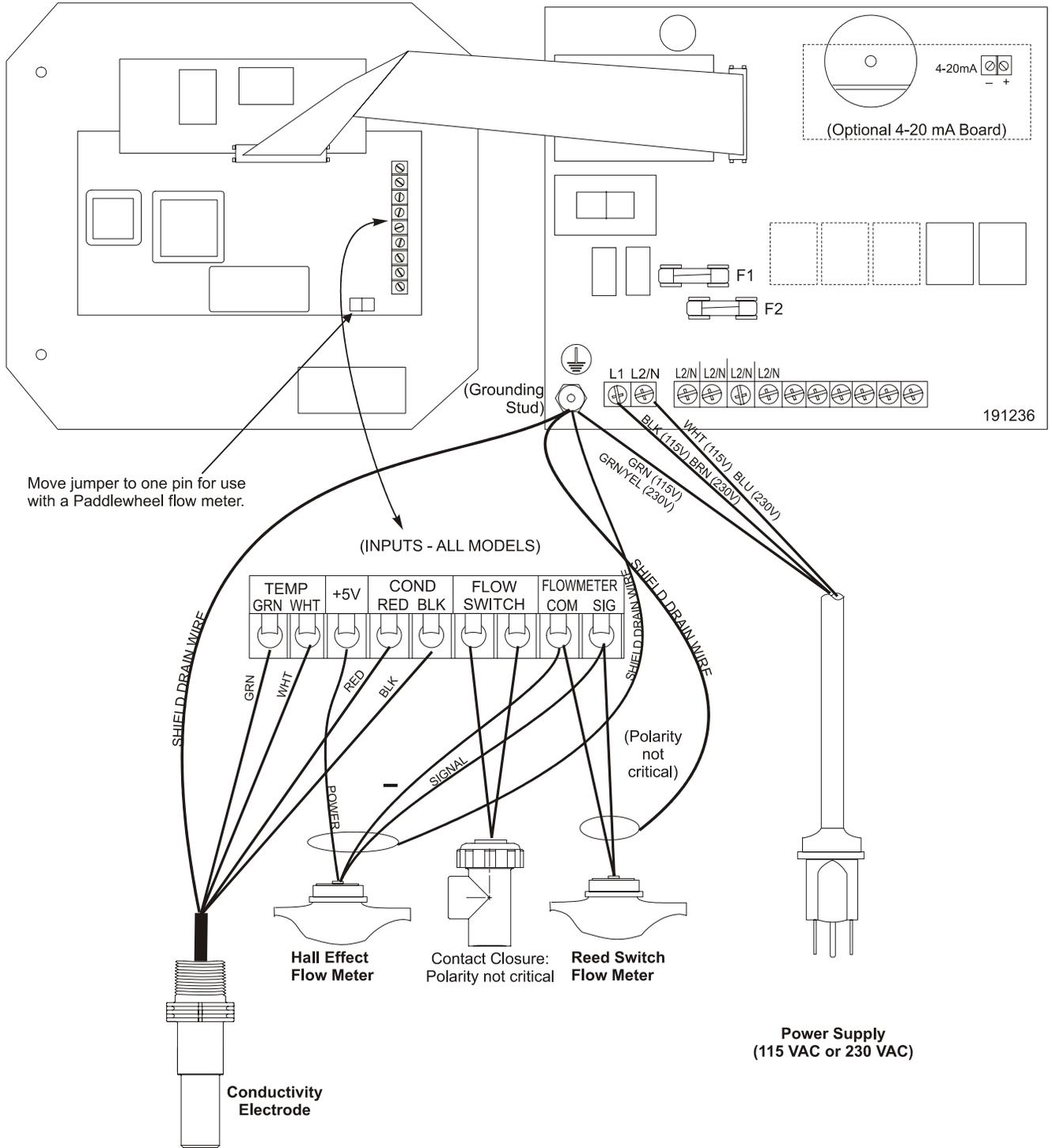
**CAUTION!** Proper grounding of this product is required. Any attempt to bypass the grounding will compromise the safety of persons and property.



**CAUTION!** Operating this product in a manner not specified by Walchem may impair the protection provided by the equipment.

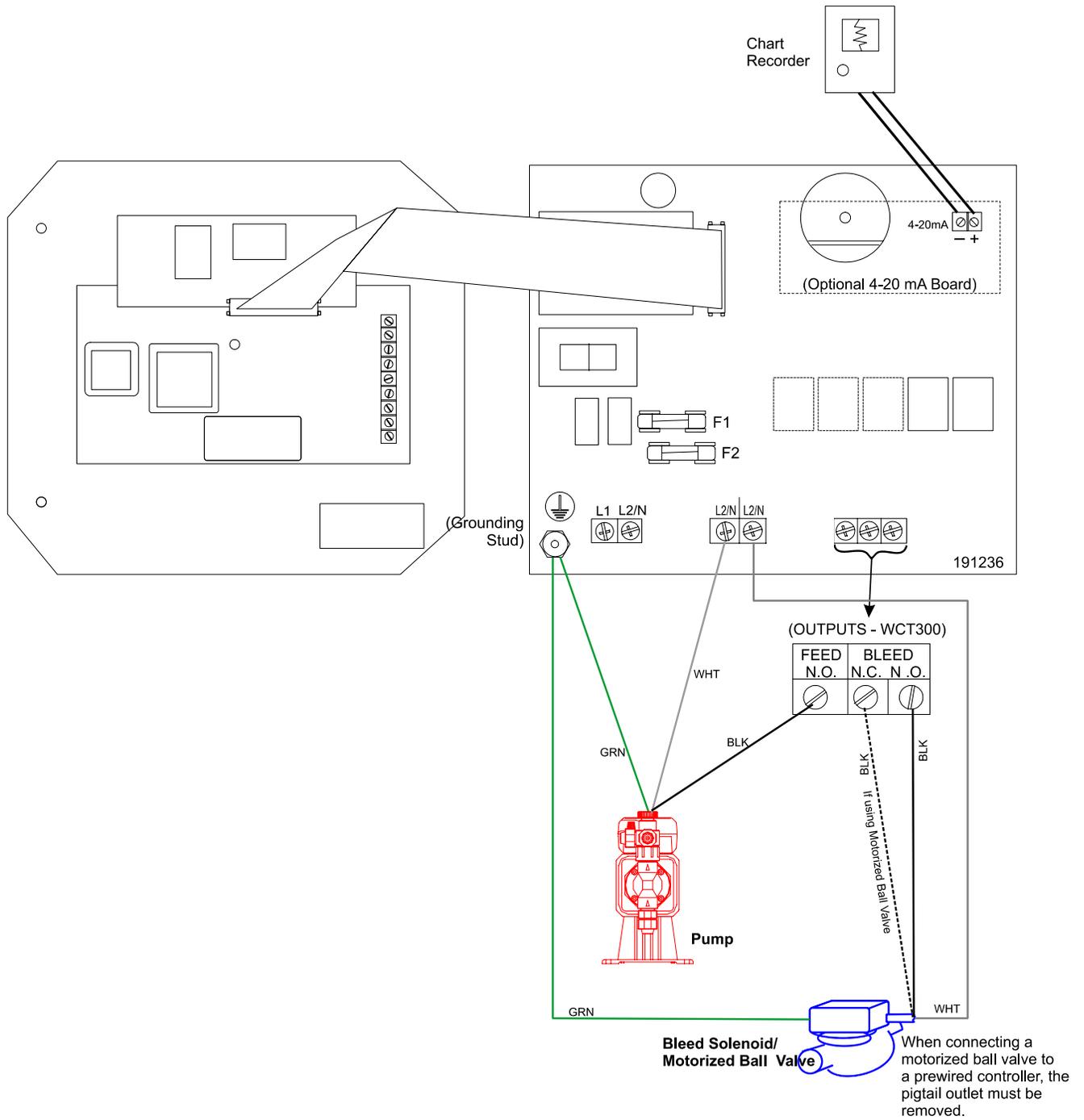


**Figure 2 Conduit/Wiring Configuration**

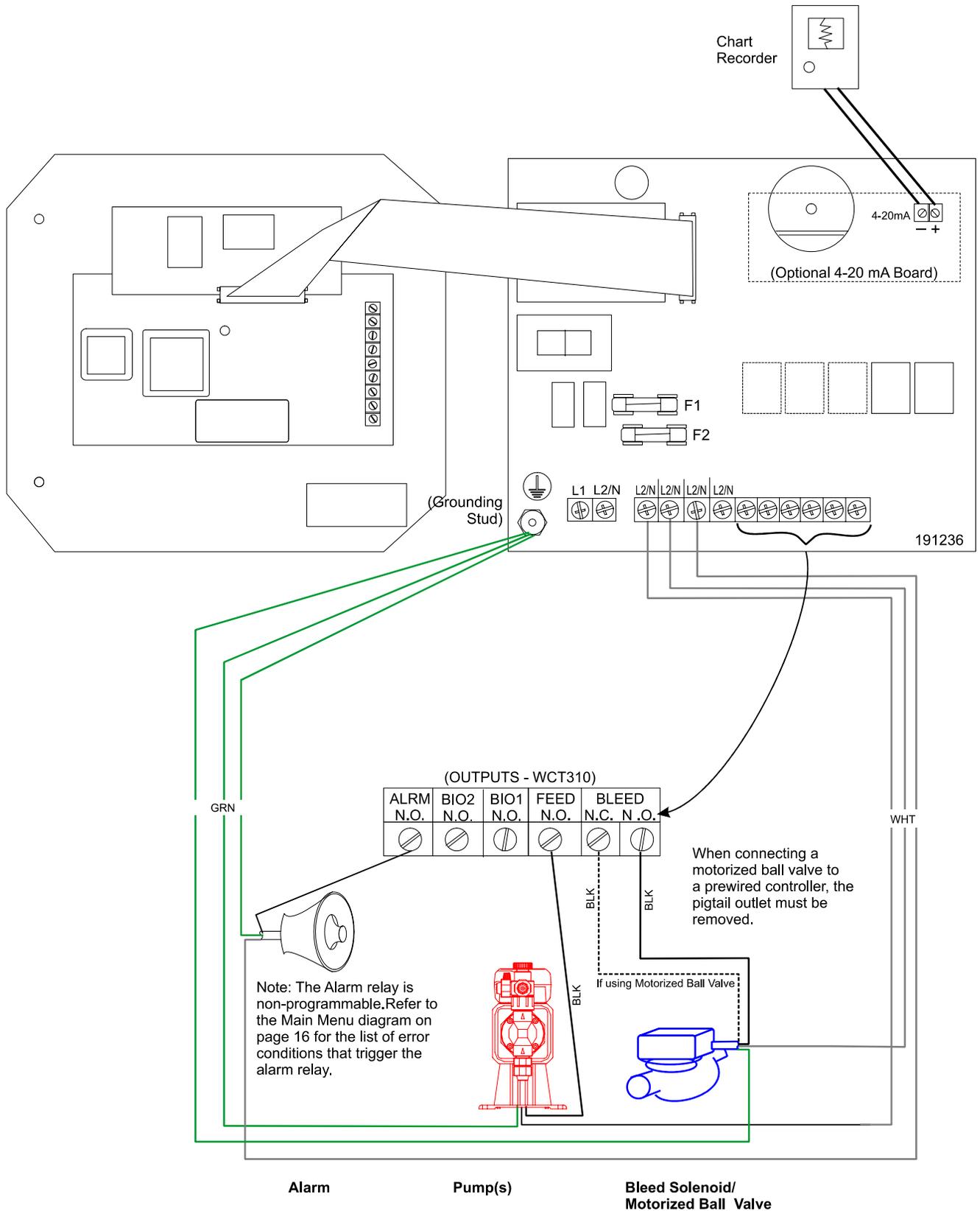


**Figure 3 Inputs (for power relay board #191236)**

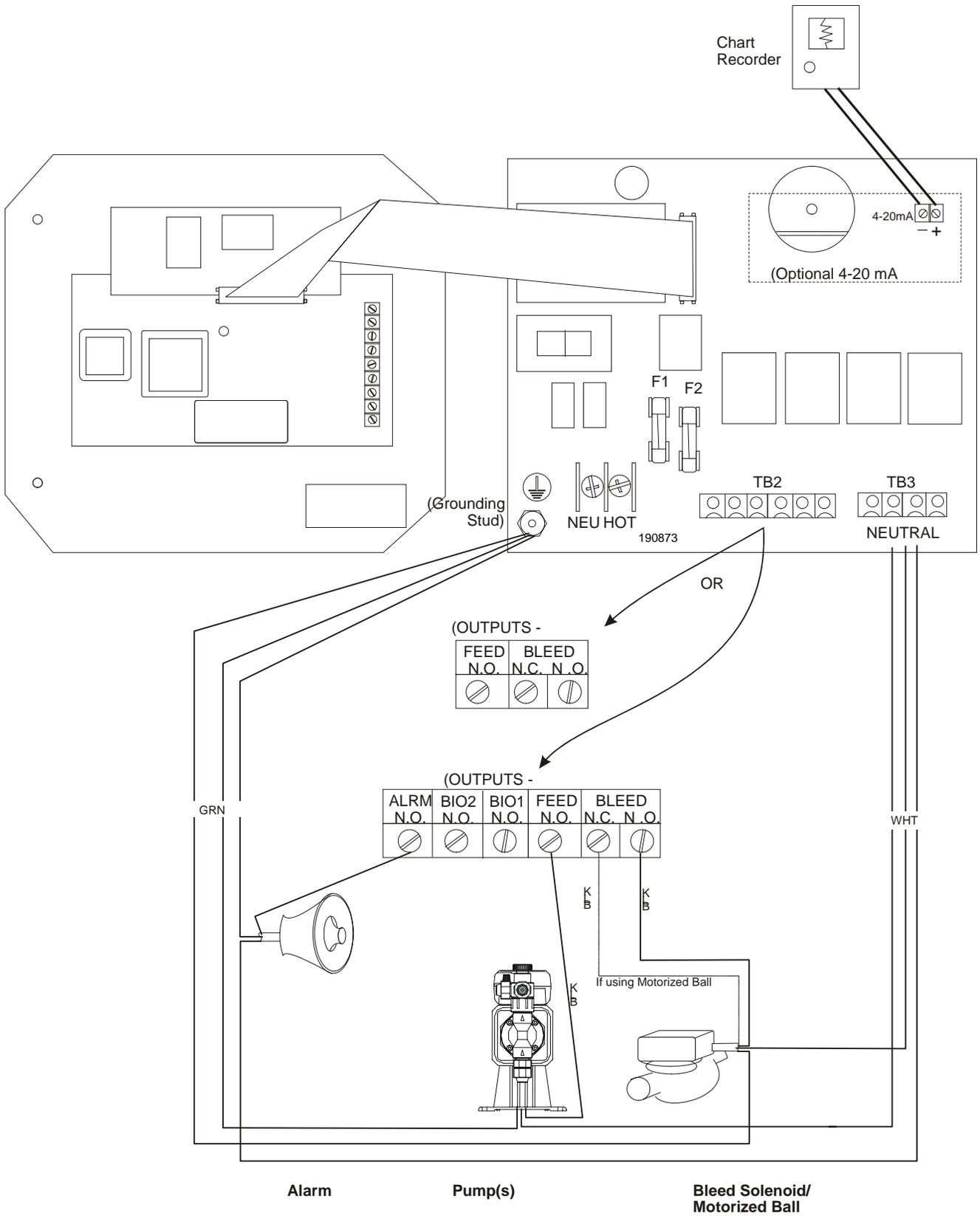




**Figure 4a W300 Outputs (for power relay board #191236)**

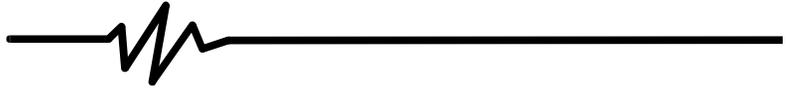


**Figure 4b W310 Outputs (for power relay board #191236)**

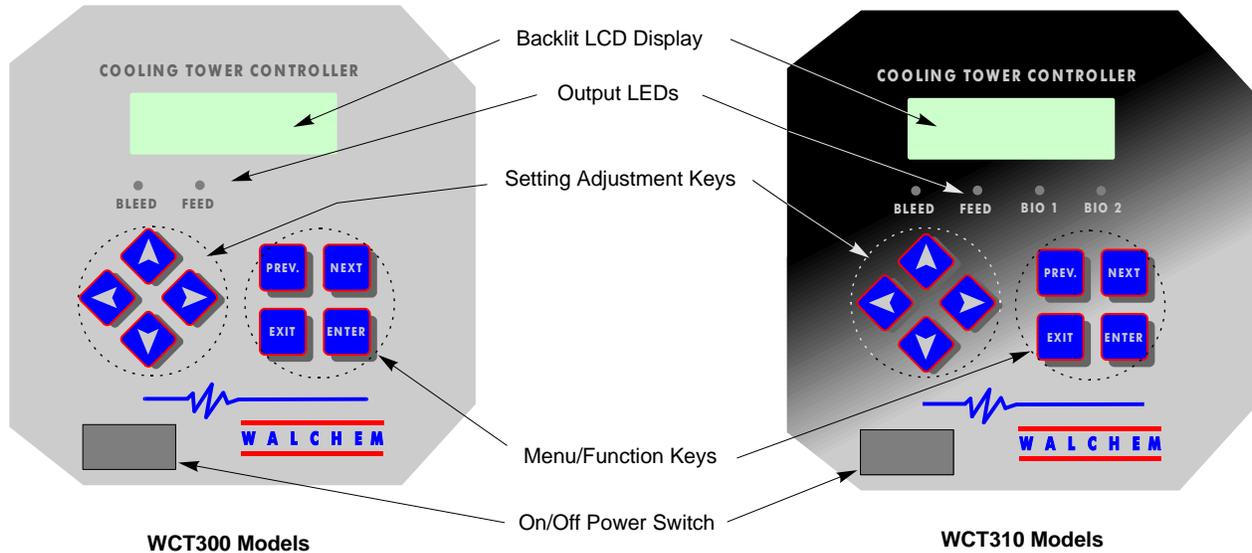


**Figure 4c Outputs (for power relay board #190873)**

## 4.0 FUNCTION OVERVIEW



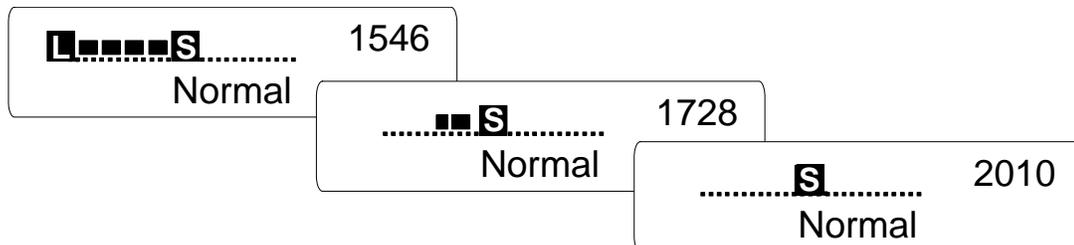
### 4.1 Front Panel



**Figure 5 Front Panel**

### 4.2 Display

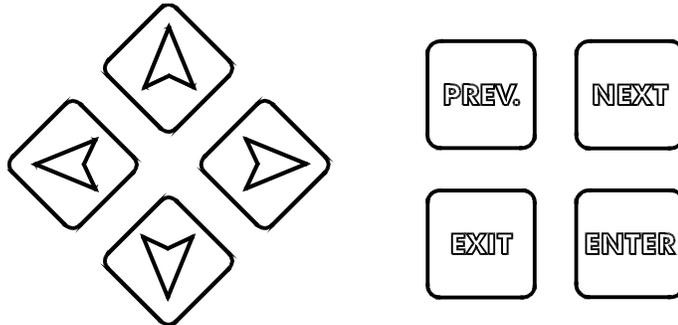
A summary screen is displayed while the WCT controller is on. This display shows a bar graph of the conductivity relative to the set point, the actual conductivity value, and current operating conditions. The center of the bar graph is at the (S), which represents the set point. For each 1% rise above the set point a vertical bar appears to the right of the (S). For each 1% drop below the set point a vertical bar appears to the left of the (S). There are small breaks in the bars at each 5%. The bar graph is limited to displaying 20% above or below the set point. When these limits are reached an (L) or (H) may appear at the end of the bar graph to indicate a low or high alarm. The operating conditions that are displayed on the bottom line of this display are Bleed, Chem Feed, Cond Hi/Lo Alarm, Sampling, Waiting, No Flow, Biocide Pre Bleed, Bleed Timeout, Biocide Add, Biocide Lockout, Sensor Error, Temperature Error, and Normal. Normal just means there is nothing unusual to report.



**Figure 6 Summary Screen**

### 4.3 Keypad

The keypad consists of 4 directional arrow keys and 4 function keys. The arrows are used to move the adjustment cursor and change settings, while the function keys are used to enter values, and navigate the various menu screens. The function keys are **ENTER**, **EXIT**, **NEXT**, and **PREV** (previous). **NEXT** and **PREV** scroll through the various menu choices. **ENTER** is used to enter a submenu and to enter a value. **EXIT** is used to back up one menu level. If you are at the main menu level, **EXIT** will return you to the Summary Display.



To change a value in a submenu, the left/right arrow keys move the cursor left and right to each digit or option that can be changed. The up/down arrows will change numeric values up or down, or scroll through option choices. Press **ENTER** only when you have finished making all of the changes for that menu screen.

### 4.4 Access Code

The WCT series controller is shipped with the access code disabled. If you wish to enable it, see Section 5.11 for operation. With the access code enabled, any user can view parameter settings, but not change them. Note that this provides protection only against casual tampering. Use a lock on the cover latch if you need more protection.

### 4.5 Startup

#### *Initial Startup*

After having mounted the enclosure and wired the unit, the controller is ready to be started.

Plug in the controller and turn on the power switch to supply power to the unit. The display will briefly show the WCT model number and then revert to the normal summary display. Scroll through the menus and calibrate the conductivity reading, temperature, and set the control parameters detailed in Section 5, Operation.

To return to the summary display, press the **EXIT** key until you return to this screen. The controller will automatically return to this screen after 10 minutes.

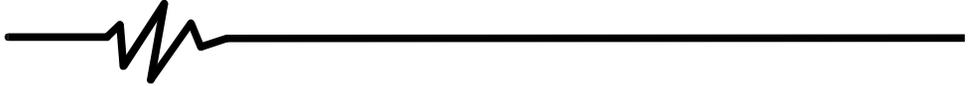
#### *Normal Startup*

Startup is a simple process once your set points are in memory. Simply check your supply of chemicals, turn on the controller, calibrate it if necessary and it will start controlling.

## 4.6 Shut Down

To shut the WCT controller down, simply turn off the power. Programming remains in memory.

## 5.0 OPERATION



These units control continuously while power is applied. Programming is accomplished via the local keypad and display.

To view the top level menu, press any key. The menu structure is grouped by inputs and outputs. Each input has its own menu for calibration and unit selection as needed. Each output has its own setup menu including set points, timer values and operating modes as needed. After ten minutes of inactivity in the menu, the display will return to the summary display. Keep in mind that even while browsing through menus, the unit is still controlling.

### 5.1 Main Menu

The exact configuration of your WCT controller determines which menus are available as you scroll through the settings. Certain menus are only available on the WCT310 controller, and others will change if you select certain options. All settings are grouped under the following main menu items.

Conductivity	
Temperature	
Bleed	
Feed	
Totalizer	WCT310 Only if Water Contactor Feed mode is selected.
Bio 1	WCT310 Only
Bio 2	WCT310 Only
Time	WCT310 Only
Alarm	
4-20mA	Only if 4-20mA option installed
Access Code	

The **NEXT** key travels forward through this list while the **PREV** key travels backwards through the list. Pressing **ENTER** will Enter the lower level menu that is currently displayed.

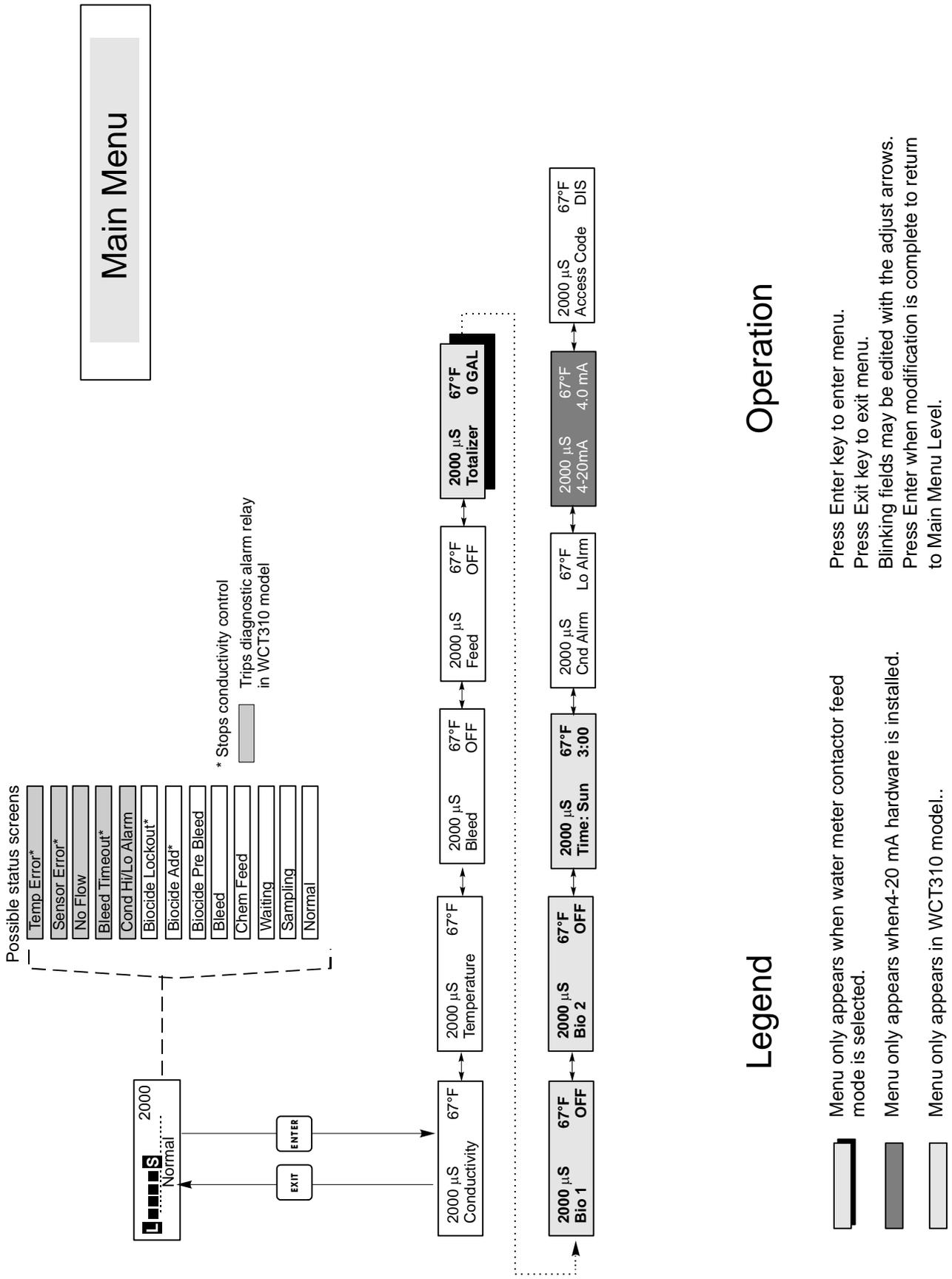


Figure 7 Main Menu

## 5.2 Conductivity Menu

The conductivity menu provides the following settings: Calibration, Self Test, Unit selection, and sampling mode setup. Additional settings are also discussed below. Refer to figure 8, Conductivity Menu Chart.

### *Calibrate*

To Calibrate the conductivity, use either a hand held meter, or a buffer solution, and adjust the WCT controller to match. Once Calibrate is entered, the unit continuously displays conductivity readings. Press an arrow key to change the value displayed to match the hand held meter or the buffer solution. You must press **ENTER** to activate the new calibration. You must press the **EXIT** key to exit calibration. The Bleed output is unaffected until the calibration menu is exited, so if it was ON when you entered calibration it will stay on until you exit.

### *Self Test*

Press **ENTER** to begin self test. Press any key to stop. Self Test internally simulates a conductivity sensor and should always give the reading  $1000 \mu\text{S}/\text{cm} \pm 20 \mu\text{S}$  if the electrode cable is 10 feet long. If the cable has been extended, the self test value will drop by 1 for each additional foot of cable. For example, if the cable has been extended 100 feet, then the self test should read  $900 \pm 20$ . If it does not, disconnect the sensor and repeat the self test. If the reading is not in the  $1000 \pm 20$  range, there is a problem with the electronics and the unit should be serviced. If the self test is in the expected range, and there is a problem calibrating, then the sensor or its wiring is at fault.

### *Units*

You may choose to display conductivity in  $\mu\text{S}/\text{cm}$  or in ppm. Press **ENTER** and then use the Up and Down arrows to change the units. If you change the units, you will be warned to check your settings. This is important. Set points are not automatically translated from  $\mu\text{S}/\text{cm}$  to ppm. If you change the units you will need to change your Bleed settings.

### *ppm C.F.*

This is the ppm Conversion Factor (or multiplier). This is typically 0.666 but can be changed to accommodate various requirements.

### *Sample Mode C/I*

Press **ENTER** to choose Continuous sampling or Intermittent sampling. A 'C' at the end of the display means that sampling is continuous, while an 'I' indicates intermittent sampling. Use Continuous sampling with a traditional bypass line installation of the conductivity sensor.

Choose Intermittent sampling to use the bleed solenoid valve for timed sampling of the conductivity. Intermittent sampling installations read the conductivity at set intervals for a given sample duration. If the conductivity is above the setpoint, the valve that controls the sampling will stay open until the conductivity falls below the setpoint. If the time the valve stays open goes beyond the sample duration, the controller will display *Xtnd* on the top status line, as well as the amount of time extended. A limit on this time may be imposed; see Figure 10 Bleed Menu.

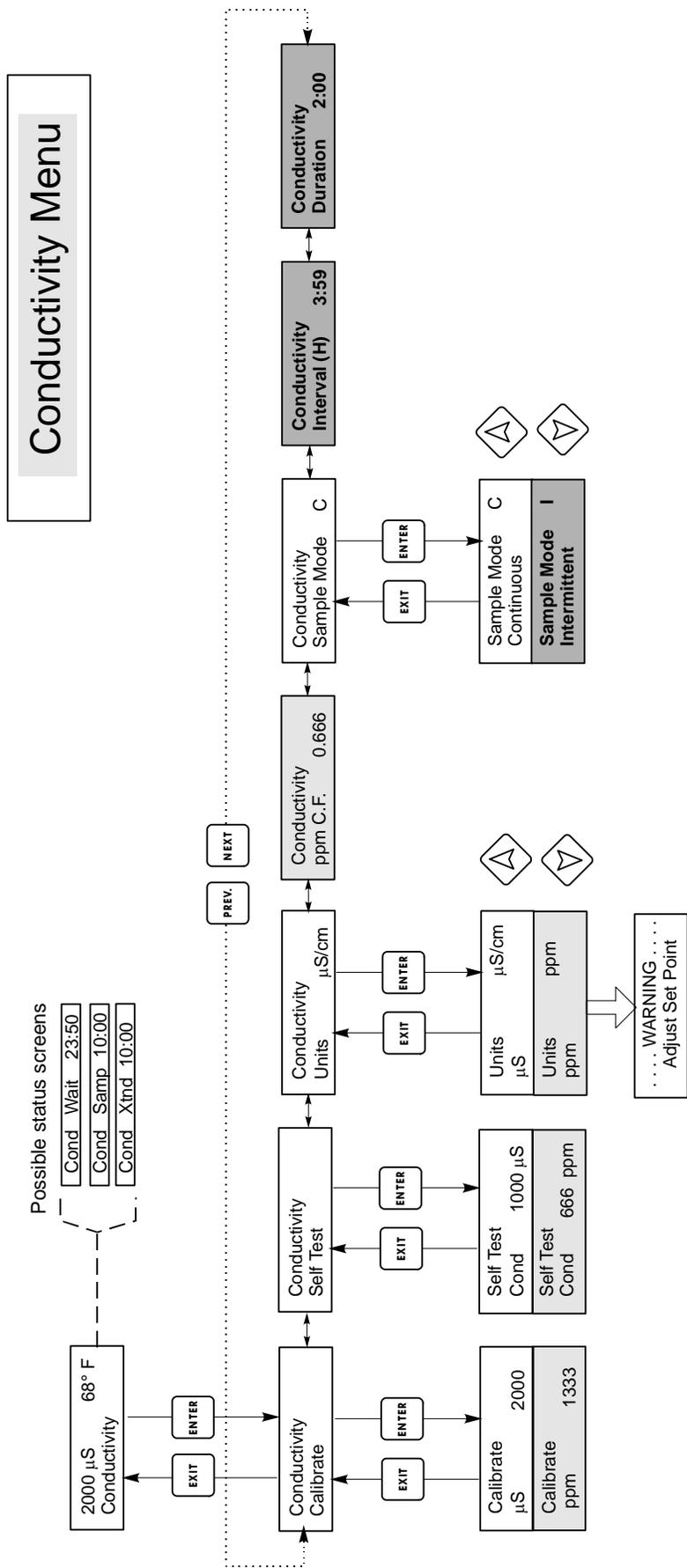


Figure 8 Conductivity Menu

## Operation

- Press Enter key to enter menu.
- Press Exit key to exit menu.
- Blinking fields may be edited with the adjust arrows.
- Press Enter when modification is complete to return to Conductivity Menu Level.

## Legend

- Menu choices that appear when ppm units are selected.
- Menu choices that appear when intermittent sampling is selected.

If Intermittent sampling is chosen, the Flow Switch input will be ignored, and the following two settings will become available:

### ***Interval***

This sets the amount of time between samples. This is set in Hours:Minutes.

### ***Duration***

This is the length of each sample. This is set in Minutes:Seconds.

## **5.3 Temperature Menu**

The Temperature menu provides the following settings: Calibration and Units (if the Temp element is detected when the unit is powered on) or Manual Temp and Units (if no temperature sensor is detected at power up). Refer to the Temperature Menu chart, figure 9.

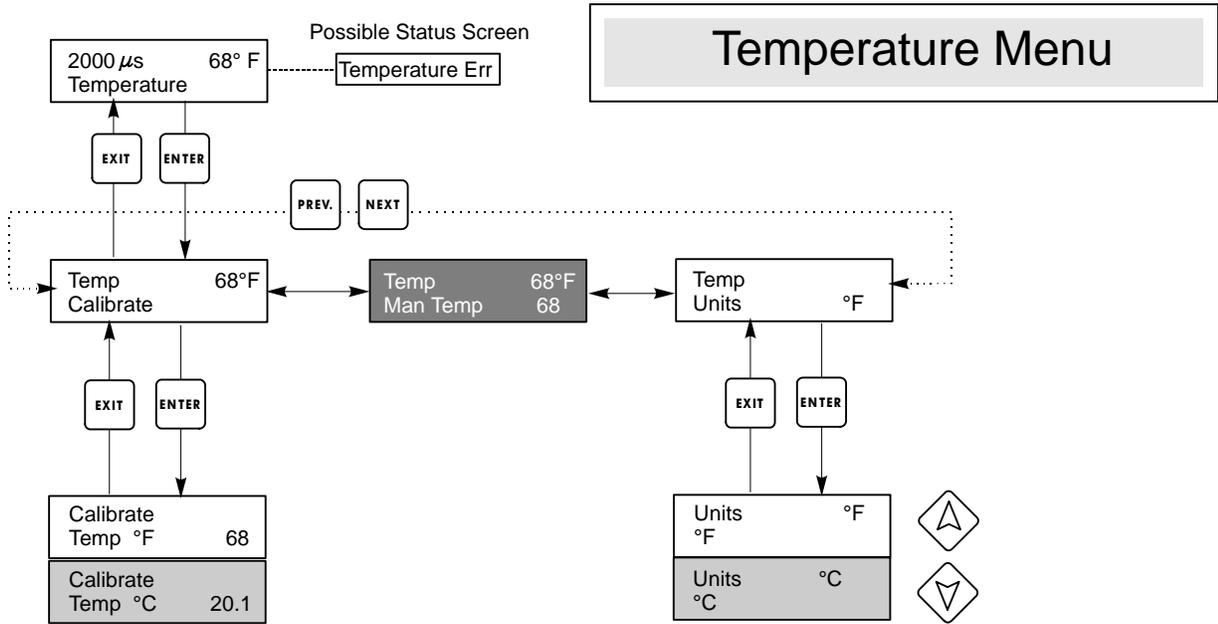
If a "Temp Error" message appears or if the "Man Temp" menu appears after the unit is powered on, it indicates the temp element is not working properly. Refer to the Troubleshooting section.

### ***Calibrate***

To Calibrate the Temperature, use a thermometer to measure the fluid temperature and adjust the WCT controller to match. Once Calibrate is entered, the unit continuously displays temperature readings. Press the Up or Down arrow key to change the value displayed to match the thermometer. You must press **ENTER** to activate the new calibration. You must press the **EXIT** key to exit calibration.

### ***Units***

You may choose to display temperature in °C or °F. Press **ENTER** and the Up or Down Arrow keys to change the temperature units for display.



**Figure 9 Temperature Menu**

## 5.4 Bleed Menu

The Bleed Menu provides the following settings: Set Point, Dead Band, Control Direction, HOA. The Bleed menu will be indicated on the display by one of the following:

Bleed A	OFF
Bleed A	10:00
Bleed A	NO FLOW
Bleed A	LOCKOUT
Bleed A	TIMEOUT

The first display indicates that the bleed output is currently OFF. The second display indicates the length of time that the Bleed output has been ON. The third indicates that bleed control has been suspended because there is presently no flow past the flow switch. The fourth display indicates that the output is currently locked out due to a biocide add or biocide lockout. The 'A' indicates that the output is being controlled automatically.

### *Set Point*

This is the conductivity value at which the bleed solenoid valve is turned ON. The factory default setting for the WCT controller is for the Bleed output to turn on when the conductivity is higher than the set point. This may be changed at the Control Direction screen.

### *Dead Band*

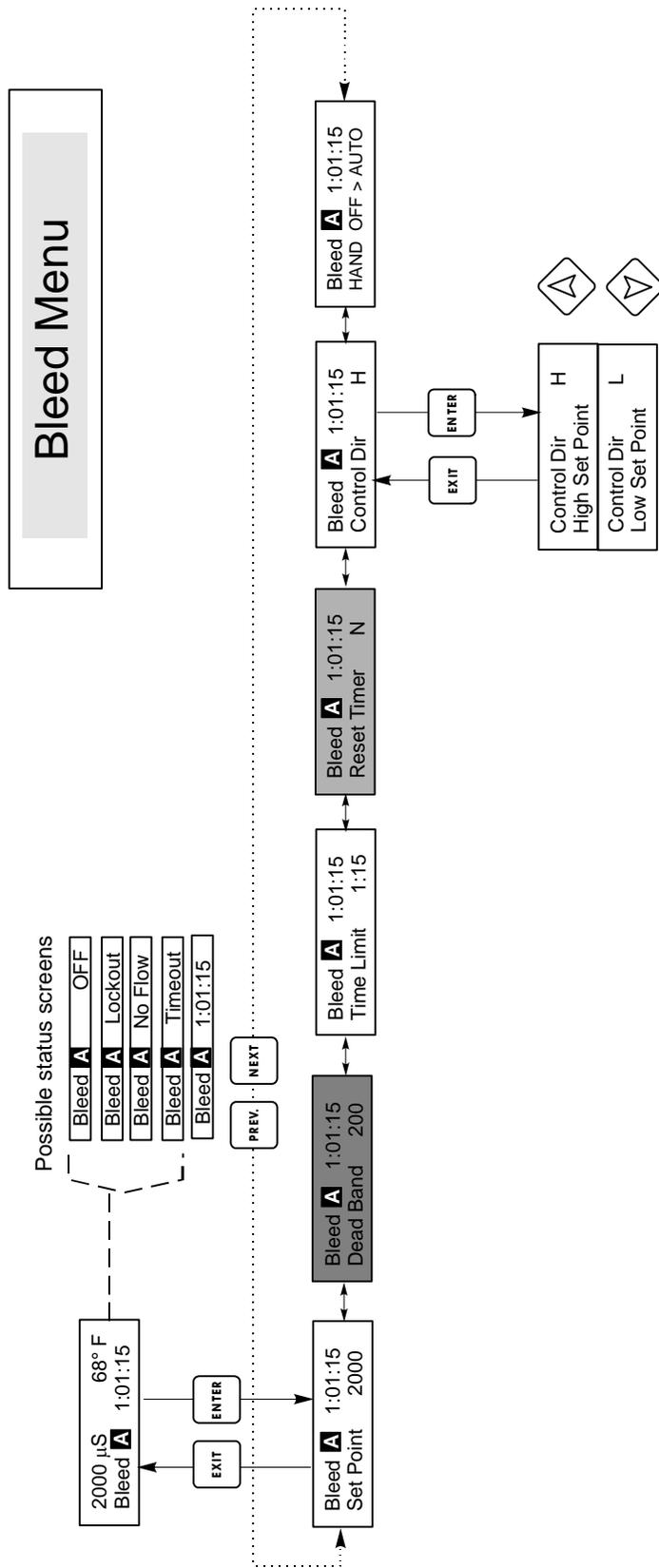
This is the conductivity value that when combined with the set point determines when the bleed output turns OFF. Assuming that the control direction is set for normal operation (High Set Point) the bleed output will turn off when the conductivity drops below the set point minus the Dead Band. For example: The set point is 1500  $\mu\text{S}/\text{cm}$  and the Dead Band is 200  $\mu\text{S}/\text{cm}$ . The bleed output turns ON when the conductivity reading is greater than 1500 but does not turn OFF until the conductivity drops below 1300.

### *Time Limit*

This menu allows you to set a maximum amount of time for the bleed. The limit time is programmed in hours and minutes and can be set between 1 minute and 8 hours:20 minutes. If the time limit is set to zero, then the valve may be open indefinitely. If the maximum time is exceeded, the bleed valve will close and will not re-open until the "Reset Timer" menu is reset by an operator.

### *Reset Timer*

Only appears if the time limit above has been exceeded. Use the up or down arrow to change "N" to "Y", then press **ENTER**.



**Figure 10 Bleed Menu**

### Legend

- Appears only if limit timer has expired.
- Appears only in continuous sample mode.

### Operation

- Press Enter key to enter menu.
- Press Exit key to exit menu.
- Blinking fields may be edited with the adjust arrows.
- Press Enter when modification is complete to return to Bleed Menu Level.

### ***Control Dir H / L***

This allows you to set the Normal (High Set Point) or Inverse (Low Set Point) operation of the bleed output. When set to High, the output turns on when the conductivity is higher than the set point. When set to Low, the output turns on when the conductivity is lower than the set point.

### ***H O A***

The "Hand Off Auto" screen allows you to select the operating mode of the bleed output. In Hand (manual) mode, the output is turned on immediately for a maximum of 10 minutes. If you walk away the output will return to Auto mode at the end of that time. In Off mode the output will stay Off indefinitely. In Auto mode the bleed output will respond to changes in conductivity based on the set point. The HOA mode of the bleed output is indicated on the bleed status lines.

## **5.5 Feed Menu**

The Feed Menu adapts to the selected Feed output mode. The modes are defined as follows:

- A Bleed and Feed with optional Lockout
- B Feed % of Bleed
- C Feed % of Time
- D Feed based on Water Contactor input

**Bleed and Feed Mode** turns the Feed output On and Off at the same time as the Bleed output. The lockout setting determines the maximum allowable time for the Feed output. If this time is exceeded the Feed output is turned off and Locked out until the Bleed output turns off.

**Feed % of Bleed Mode** tracks the length of time that the Bleed output is on. When the bleed turns off the feed output is energized for a user defined proportion of the bleed time.

**Feed % of Time Mode** turns on the Feed output for a user definable % of a timed cycle. The time cycle length is adjustable from 10 to 60 minutes.

**Feed based on Water Contactor Input Mode** turns on the Feed output for a user definable time each time a water contactor pulse is detected. This contactor input can be divided to accomodate a large variety of water meters. Contacts will accumulate feed time so that all contacts are accounted for.

Hint: For easiest programming, program Feed Mode first, then step through the rest of the feed parameters

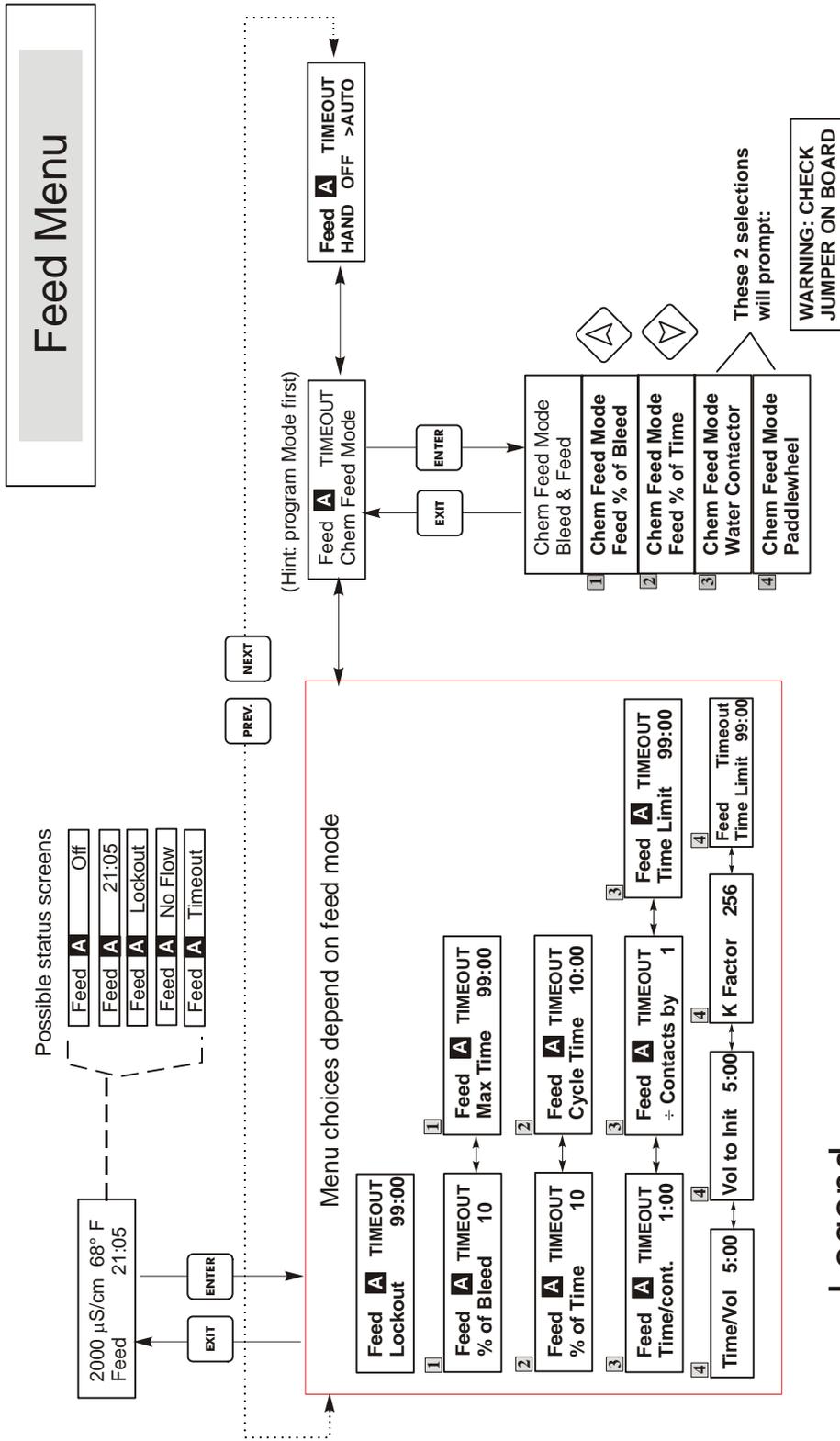


Figure 11 Feed Menu

## Operation

- Press Enter key to enter menu.
- Press Exit key to exit menu.
- Blinking fields may be edited with the adjust arrows.
- Press Enter when modification is complete to return to Feed Menu Level.
- Press Enter or Adjust arrow to turn on/off output at Hand menu.

## Legend

- 1 Menu choices that appear when Feed as % of Bleed mode is selected.
- 2 Menu choices that appear when Feed as % of Time mode is selected.
- 3 Menu choices that appear when Feed based on Water contactor input is selected.
- 4 Menu choices that appear when Feed based on Paddlewheel input is selected.

The Feed menu will be indicated on the display by one of the following:

Feed A OFF

Feed A 10:00

Feed ANO FLOW

Feed A TIMEOUT

Feed A LOCKOUT

The first display indicates that the Feed output is currently OFF. The second display indicates the length of time that the Feed output has been ON, or the length of time that the Feed output will be ON. The third indicates that Feed control has been suspended because there is presently no flow past the flow switch. The fourth display indicates that the feed lockout timer in the Bleed and Feed mode has expired. The fifth display indicates that the output is currently locked out due to a biocide add or biocide lockout.

The 'A' indicates that the feed is being controlled automatically.

## **Bleed and Feed Mode**

### ***Lockout***

Set this for the Feed Lockout Time. The lockout time is the maximum length of time that the feed output can be on. If the lockout time is set to 0:00, the lockout timer is no longer used and the feed output will be on for as long as the bleed is on. This is set in minutes and seconds.

## **Feed % of Bleed Mode**

### ***% of Bleed***

This is the % value that is multiplied times the accumulated bleed time to determine how long the feed will be. For example, if the bleed was on for 10 minutes and this setting was 50%, the feed output would be on for 5 minutes.

### ***Max Time***

This is similar to the lockout time above in that the feed output will not exceed this maximum length. This is set in minutes and seconds.

## **Feed % of Time Mode**

### ***% of Time***

This is the % value that is multiplied times the cycle length to determine the length of time that the feed output is ON. If the cycle length were 10 minutes and this setting was 40%, the feed output would be on for 4 minutes, then off for 6 minutes and then repeat the cycle.

### ***Cycle Time***

This determines the length of the cycle to be used. This is set in minutes and seconds.

## **Feed Based on Water Contactor Mode**

**Note: The jumper on the processor board must be in the position shown in Figure 3.**

### ***Time/Cont.***

(Time per contact.) This determines the length of time that the feed pump should be on for each contact that is received. This is set in minutes and seconds.

### ***÷ Contacts By***

This setting allows a divider to be entered. The divider will count actual contacts from the meter until the setting is reached before a contact is considered to be received. For example, if the divider is set to 10 and the Time/Cont is set to 5:00, then the feed output would turn on for 5:00 minutes after 10 contacts were received.

### ***Time Limit***

This setting puts a limit on the amount of time that can be accumulated by the water meter input. Once this setting has been reached, all contacts will be ignored until the accumulated feed time expires. By setting Time Limit = Time/Cont., the accumulation of contacts can be disabled. This is set in minutes and seconds.

## **Feed Based on Paddlewheel Mode**

**Note: The jumper on the processor board must be in the position shown in Figure 3.**

### ***Time/Vol***

This setting determines the pump on-time once a given volume of water has passed through the paddlewheel sensor. The volume required to initiate feed is set below.

### ***Vol to Init.***

This setting determines the volume of makeup water that will initiate chemical feed.

### ***K Factor.***

Enter the number of pulses per unit volume that the paddlewheel sensor sends out. This value is usually printed on the sensor's flow cell or in its instructions.

### ***Time Limit***

This setting puts a limit on the amount of time that can be accumulated by the water meter input. Once this setting has been reached, all contacts will be ignored until the accumulated feed time expires. By setting Time Limit = Time/Vol., the accumulation of contacts can be disabled. This is set in minutes and seconds.

The following settings are for all feed modes.

***Chem Feed Mode***    *A / B / C / D*

This allows the user to select the chemical feed mode as described above.

***H O A***

This sets the Hand Off Auto for the feed output. This was explained in the Bleed Menu section and functions similarly. In Off position, the output will not turn ON regardless of the feed mode selected.

**5.6 Totalizer Menu**

The Totalizer menu is only available on the WCT310 controller, and is only visible when the feed mode has been set to the Water Contactor mode or Paddlewheel mode. The Totalizer menu will be indicated on the display as follows:

Tot 100 Gal or Liters

***Reset Totalizer***    *N*

This allows you to restart the totalizer display. Press the Up or Down arrow key to change the N to Y and press **ENTER** to reset the totalizer to 0 gal.

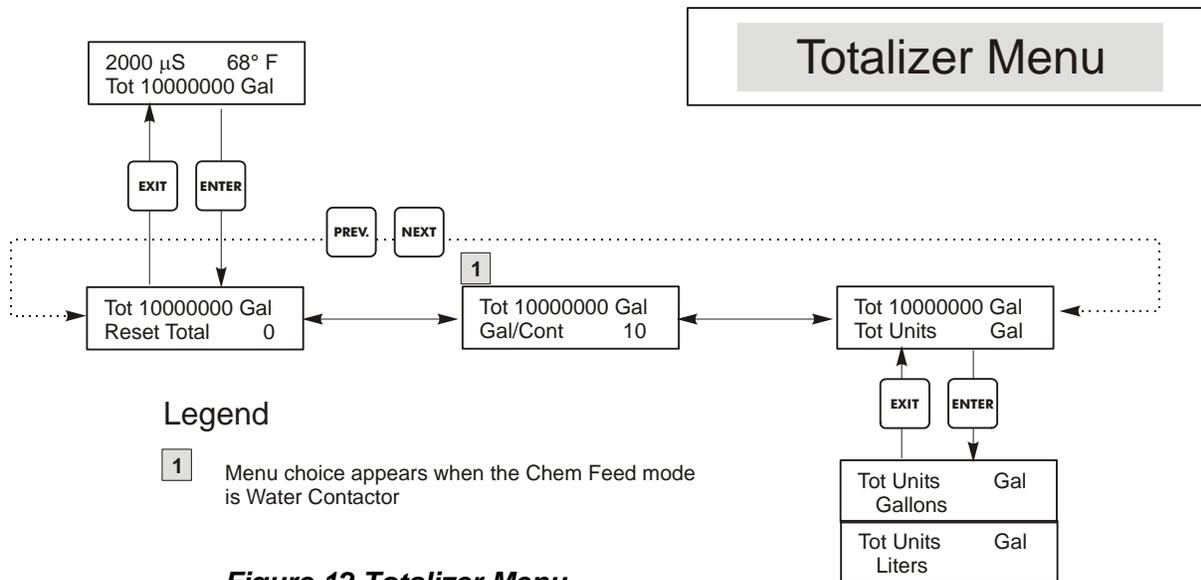
The totalizer will count up to a maximum of 99,999,999. After that it will reset itself to zero.

***Vol/cont*** (Only appears if the Chem Feed mode is Water Contactor)

This allows you to set the volume of makeup per contact from the water meter.

***Tot Units***

This is used to set the units of measure for the totalizer. Press **ENTER**, then use the UP and DOWN arrow keys to toggle between "Gallons and "Liters."



**Figure 12 Totalizer Menu**

## 5.7 Bio1 and Bio2 Menus

These menus are only available on the WCT310 controller. The Bio 1 and Bio 2 menus are separate from each other but operate in exactly the same way. Each menu provides the following independent settings: Prog Bio Adds, Bio Pre-Bleed, Bio Lockout Time, Set Bio Mode, HOA. Bio menus may display the following screens:

Bio 1 A	OFF
Bio 1 A	PENDING
Bio 1 A	PRE BLD
Bio 1 A	4:50
Bio 1 A	NO FLOW

Hint: When programming the unit for the first time, it is recommended that the Biocide Add Mode be chosen first, then step through the rest of the Biocide Add menu indicated below and in figures 13 and 14. This will make programming simple and logical.
--

The first screen indicates that the Bio 1 output is off. The second screen indicates that Bio 1 is ready to begin a biocide cycle but is unable to begin due to NO FLOW, or Bio 2 already ON. The third screen indicates that Bio 1 is in the Pre-Bleed portion of its cycle. The Fourth screen indicates that Bio 1 is adding and has 4 minutes and 50 seconds remaining to add, or that there are 4 hours and 50 minutes of Bio 1 Lockout remaining. If the Bio 1 LED is ON, the timer is for the Add. If the LED is OFF, the timer is for remaining lockout time. The last display indicates that there is no biocide activity and none is pending and that there is no flow past the flow switch.

A number of built-in interlocks are part of the biocide feed program. When one biocide relay activates, the other biocide will be locked out until the first biocide finishes its control cycle. Similarly, the bleed relay is locked out once the biocide cycle begins (except for the pre-bleed portion of the cycle). Bear this in mind, especially if the biocide feed time is very long or very frequent...very little time is left in the day to control the conductivity.

The inhibitor feed relay interaction is more complex.

For Bleed and Feed mode, since the bleed relay is locked out, the feed relay will be locked out as well.

For Feed as % Bleed, if the bleed is adjacent to the start of the biocide cycle, or is during the pre-bleed part of the cycle, the feed time does not occur.

For Feed as % Time, the feed relay is locked out during the biocide add, the feed events are not stored in memory, but the feed cycle time is reset once the biocide add cycle is over, so that as soon as the biocide cycle is complete, one feed cycle will occur.

For Water Contactor or Paddlewheel mode, the water flow is stored in memory, up to 256 contacts, and the correct feed time is activated once the biocide cycle has completed.

### ***Prog Bio 1 Add***

Press **ENTER** here to see a list of all of the biocide adds presently scheduled. The first screen displayed is for Today's Biocide add. Use the **NEXT** key to see Tomorrow's add or the **PREV** key to see Yesterday's add. Use the arrow keys to edit the starting time or length of the add. The screen should look similar to the one below:

```
Prog Bio 1 Add  
2Mon 10:00 45
```

The bottom line indicates that on the second Monday in a multi-week cycle, Bio 1 will begin its Biocide Addition cycle at 10 AM and will add for 45 minutes. If the biocide output does not come on at exactly 10 AM, there may be NO FLOW, or there may be a conflict with Biocide output 2. If either of these conditions is true, the output will be delayed until the flow has been restored, or the Biocide 2 lockout time is completed. The times are set in a 24 hour format, so 1 PM is entered as 13:00. The WCT310 supports 1 week cycles, 2 week cycles and 4 week cycles. It is not necessary for both biocide outputs to be on the same cycle.

Press the **EXIT** key to exit the Prog Bio 1 menu. There are separate Bio 1 and Bio 2 Program menus and separate program memories, allowing addition of each biocide independently.

### ***Pre Bleed***

This setting provides a Pre Biocide Add Bleed Conductivity Set Point. Pre Bleed is the first step in a biocide addition. The operating conductivity must be lower than this setting before the biocide output will turn ON. If the conductivity is higher than this set point, the bleed output is turned on to lower the conductivity. This setting is independent of the bleed set point in the Bleed Menu. There are separate Bio 1 and Bio 2 Pre Bleed settings. To disable the Pre Bleed, set this value higher than your operating set point or set the value to zero.

### ***Lockout***

This setting determines how long bleed and additional biocide adds will be locked out after completing a biocide add. This value is set in hours and minutes. There are separate Bio 1 and Bio 2 settings. This can be set to 0 if it is not desired.

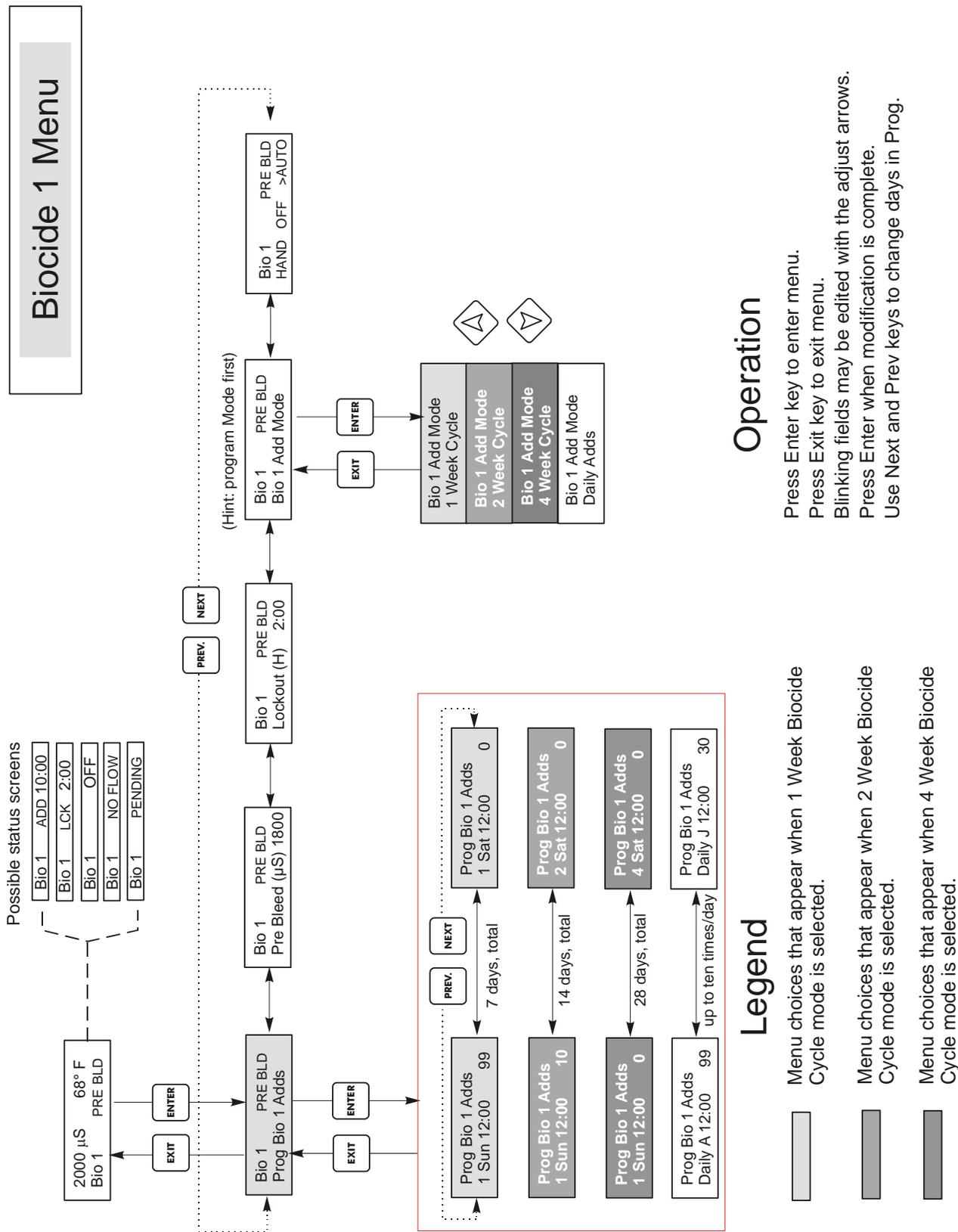
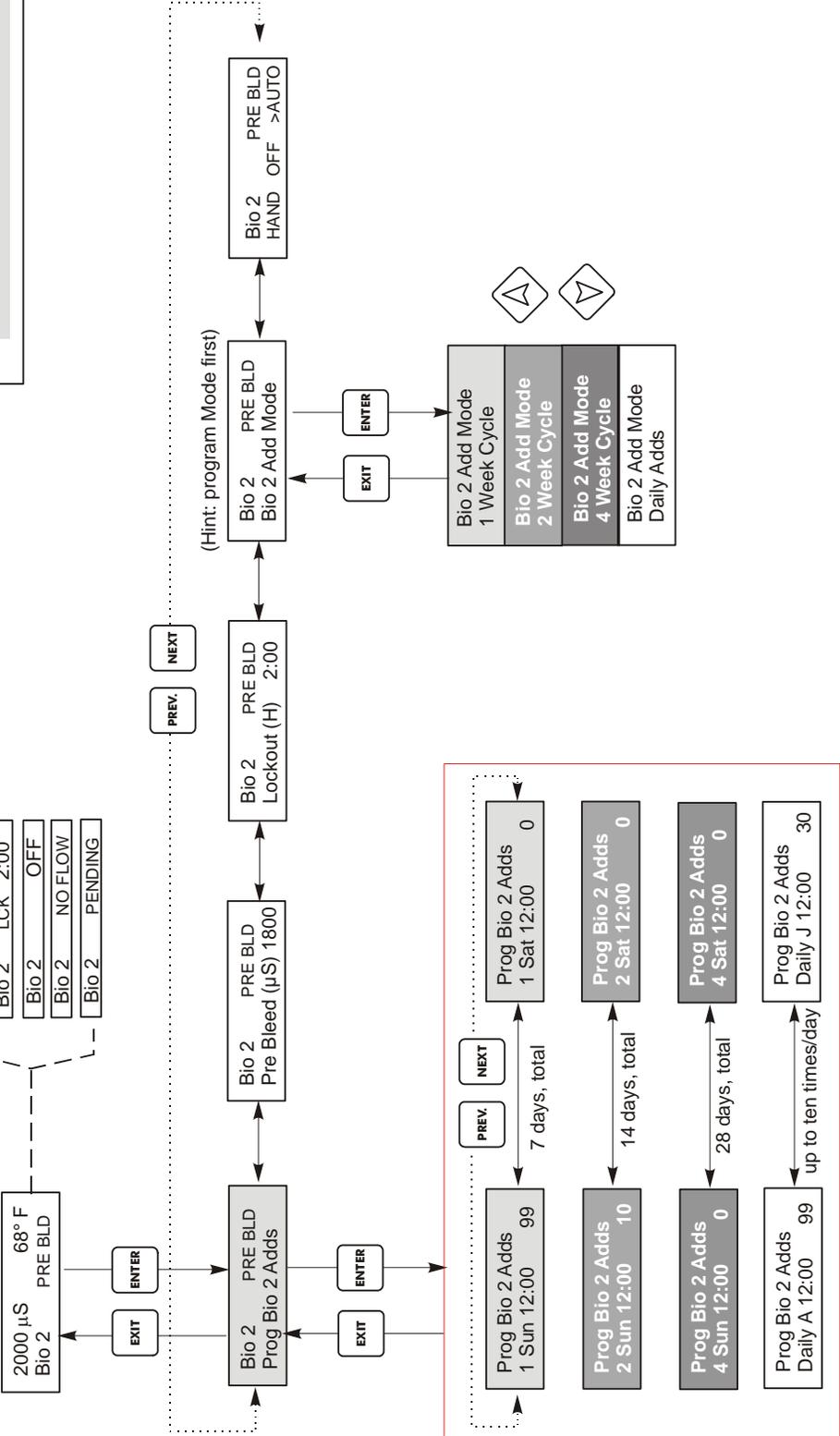


Figure 13 Biocide 1 Menu

# Biocide 2 Menu

Possible status screens

- Bio 2 ADD 10:00
- Bio 2 LCK 2:00
- Bio 2 OFF
- Bio 2 NOFLOW
- Bio 2 PENDING



## Operation

- Press Enter key to enter menu.
- Press Exit key to exit menu.
- Blinking fields may be edited with the adjust arrows.
- Press Enter when modification is complete.
- Use Next and Prev keys to change days in Prog.

## Legend

- Menu choices that appear when 1 Week Biocide Cycle mode is selected.
- Menu choices that appear when 2 Week Biocide Cycle mode is selected.
- Menu choices that appear when 4 Week Biocide Cycle mode is selected.

Figure 14 Biocide 2 Menu

### Bio 1 Add Mode 1

The last digit indicates that Bio 1 adds are scheduled on a 1 week repeating cycle. To change this, press the **ENTER** key and then use the Up or Down arrow keys to select the appropriate choice. Biocide cycles may be daily (up to ten times per day) or 1, 2, or 4 weeks long. This is provided to save you some programming effort. If you add the same thing every week, use the 1 week cycle. If you wish to add Biocide 1 only once every two or four weeks use the 2 or 4 week cycle. If you wish to add Biocide 1 more than once a day, choose the daily cycle.

The Bio 1 cycle length is not affected by the Bio 2 cycle length. In weekly cycle modes, the WCT310 can schedule one add per day for each Biocide output for up to 4 weeks. If a daily cycle is chosen, that biocide can be added up to ten times per day, every day.

### H O A

This is the Hand Off Auto selector screen for the Biocide output. There are separate settings for Bio 1 and Bio 2. In the Off position Biocide adds can be missed. See the description in the Bleed menu for more details about HOA settings.

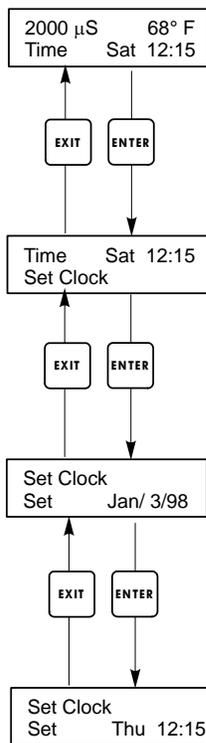
## 5.8 Clock Menu

This Menu is only available on the WCT310 series controller. This menu has only one choice, to set the clock used for Biocide adds. This menu will appear as follows:

Time: 2Mon 10:20

### Set Clock

Press **ENTER** to set the clock. Use the arrow keys to adjust the day and time and then press **ENTER** to store or **EXIT** to discard. If either biocide is set for a 2 or 4 week cycle, it may display the week number, which is calculated by the controller and can not be changed. If no week number is shown, it's week 1. If the longest biocide cycle is 2 weeks, the 3Sun through 4Sat choices are not shown.



Clock Menu is only present if Biocide Option is installed.

Figure 15 Clock Menu

## 5.9 Alarm Menu

This menu is available for both WCT300 and WCT310 series controllers, however, only the WCT310 has a relay output for the alarm. On both units the settings here determine when the (L) and (H) indicators appear on the summary screen. The Alarm menu screen will appear as follows:

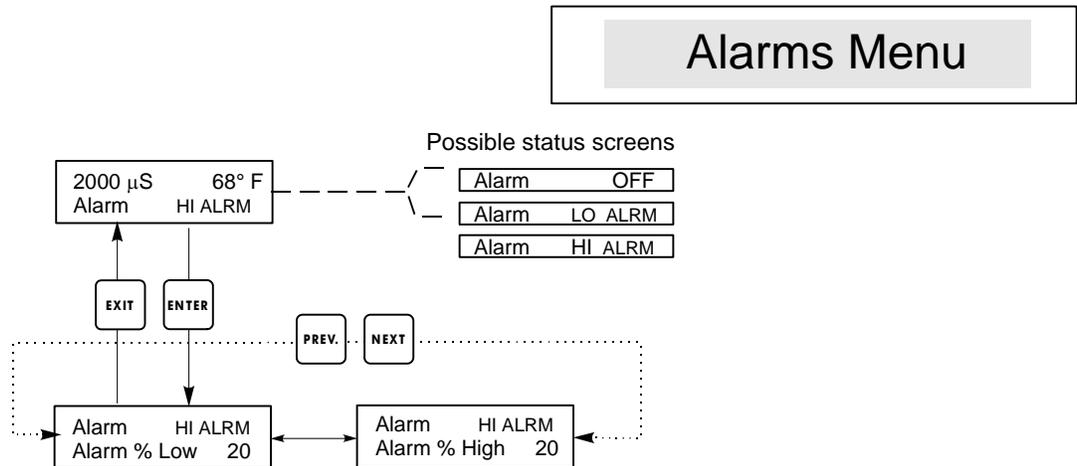
Alarm OFF  
 Alarm LOW ALRM  
 Alarm HI ALRM

### *Set % Low*

This is the % below the bleed set point that the LOW ALARM will activate. If the set point is 1000 and the % Low setting is 20 then the Low alarm will activate at 800. Set to 0% to disable low alarm.

### *Set % High*

This is the % above the bleed set point that the HIGH ALARM will activate. If the set point is 1000 and the % Low setting is 20 then the High alarm will activate at 1200. Set to 0% to disable high alarm.



**Figure 16 Alarm Menu**

## 5.10 4-20mA Menu

This menu is only available if the 4-20mA output is installed in the controller. The 4-20mA output is available for either the WCT300 or WCT310 series controllers. This menu provides for scaling and calibrating the output. The 4-20mA menu screen appears as follows:

4-20mA 9.20mA

This indicates that the current output of the 4-20mA card is 9.20 mA.

### *Set 4mA Pt*

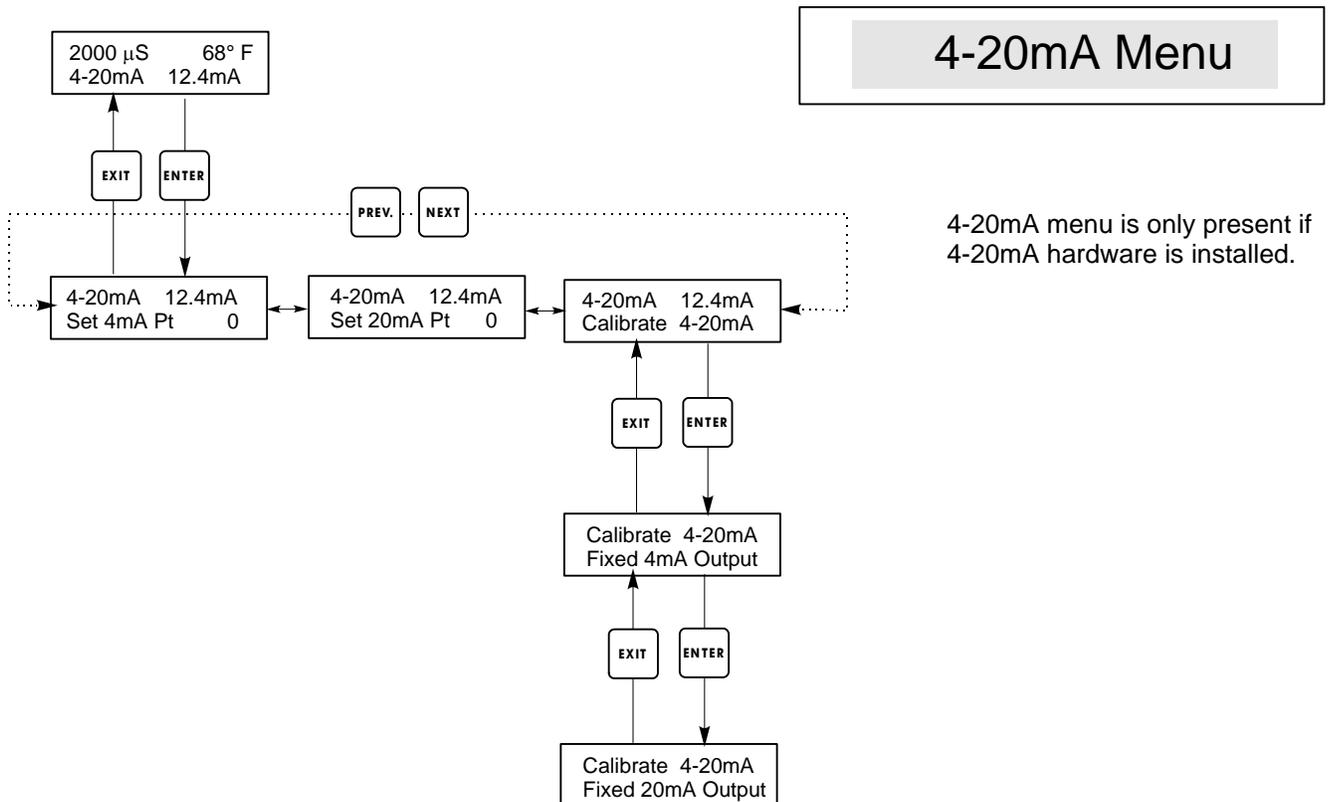
This conductivity setting will correspond to a 4 mA output from the controller.

### *Set 20mA Pt*

This conductivity setting will correspond to a 20mA output from the controller.

### *Calibrate*

This will provide fixed 4mA and fixed 20mA outputs to allow you to calibrate connected equipment.



**Figure 17 4-20 mA Menu**

## 5.11 Access Code Menu

This menu determines whether the access code feature of the controller is enabled or disabled and allows you to customize the access code to your own value. The access code controls whether or not you are allowed to change the parameters in the controller. With the access code disabled, any user may change any parameter. With the access code enabled, any user can view any parameter, but cannot change them. Once an attempt is made to change a parameter, the display will prompt the user to enter the access code. If the correct access code is entered, the parameters can be changed. If the wrong access code is entered the parameters cannot be changed. Once the access code has been correctly entered, it will remain valid until there is a period of 10 minutes without a key being pressed. The access code menu will appear as shown below:

```
Access Code  DIS
Access Code  REQ
Access Code  OK
```

The first display indicates that the access code is disabled. No access code is required to change any setting. The second display indicates that the access code is required to alter settings. The last display indicates that the access code is required and has been entered correctly.

### *Enable N / Y*

Press the Up or Down arrow key to change the N to Y and press **ENTER** to enable the access code feature. If the access code is enabled you must first enter the access code to disable it.

### *New Value*

Press **ENTER** to display the current access code value and use the arrow keys to change it to any value between 0 and 9999. If the access code has been enabled, you will be prompted to enter the current access code before being allowed to change it. You must remember the access code if you enable it.

The Factory default Access code is 1995.

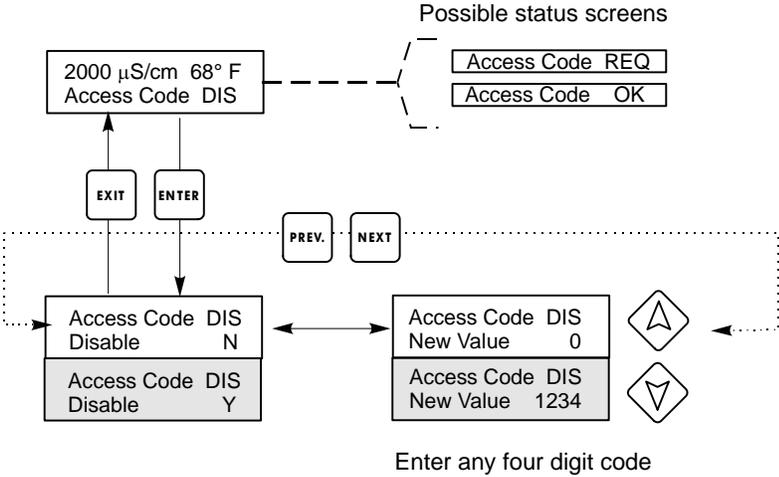
If you change the access code and can't remember it follow this procedure:

1. Turn off power to the controller.
2. Wait 10 seconds.
3. Press and Hold the UP and DOWN arrow keys while turning on the power.
4. Read the access code on the display.
5. Release the keys, and the access code will disappear.

# Access Code Menu

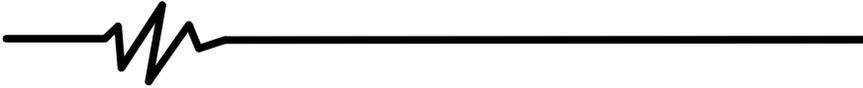
Any Top Display  
Access Code 0000

The Access Code prompt may appear at any screen in the entire menu structure if the current access code has not been entered by the user. Access code entries will be valid for 10 minutes from the most recent key press.



**Figure 18 Access Code Menu**

## 6.0 MAINTENANCE



The WCT controller itself requires very little maintenance. Wipe with a damp cloth. Do not spray down the controller unless the enclosure door is closed and latched.

### 6.1 Probe Cleaning

NOTE: The controller must be recalibrated after cleaning the probe.

#### *Frequency*

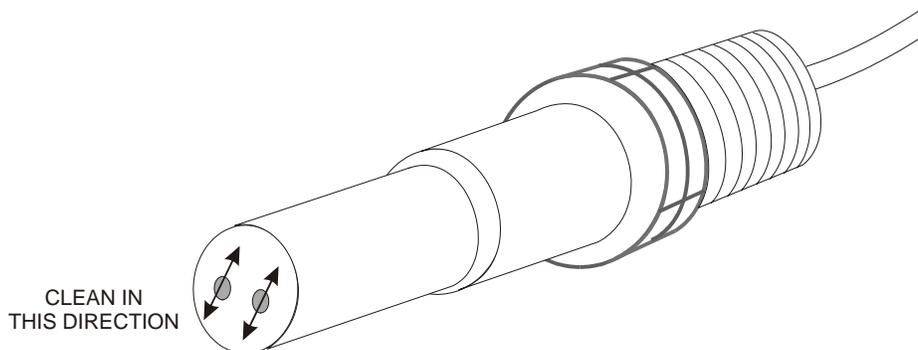
The probe should be cleaned periodically. The frequency required will vary by installation. In a new installation, it is recommended that the probe be cleaned after two weeks of service. To determine how often the probe must be cleaned, follow the procedure below.

1. Read and record the conductivity.
2. Remove, clean and replace the conductivity probe.
3. Read conductivity and compare with the reading in step 1 above.

If the variance in readings is greater than 5%, increase the frequency of probe cleaning. If there is less than 5% change in the reading, the probe was not dirty and can be cleaned less often.

#### *Cleaning Procedure*

The probe can normally be cleaned using a cloth or paper towel and a mild detergent. If coated with scale, clean with a dilute (5%) hydrochloric acid solution. Occasionally a probe may become coated with various substances which require a more vigorous cleaning procedure. Usually the coating will be visible, but not always. To clean a coated probe, use a fine grit abrasive, such as emery paper. Lay the paper on a flat surface and move the probe in a back and forth motion. The probe should be cleaned parallel to the carbon electrodes, not perpendicular.



**Figure 19 Cleaning the Probe**

## 6.2 Replacing the Fuses

**CAUTION:** Disconnect power to the controller before opening front panel!

Locate the fuses on the circuit board at the back of the controller enclosure. (See figure 3.) Gently remove the old fuse from its retaining clip and discard. Press the new fuse into the clip, secure the front panel of the controller and return power to the unit.

**Warning:** Use of non-approved fuses can affect product safety approvals. Fuse ratings depend on controller power rating. Specifications are shown below. To insure product safety certifications are maintained, it is recommended that a Walchem fuse is used.

Controller Rating	F1	Walchem P/N	F2	Walchem P/N
120 VAC	5 x 20 mm, 0.125A, 250V	102369	5 x 20 mm, 10A, 125V	102432
240 VAC	5 x 20 mm, 0.063A, 250V	103363	5 x 20 mm, 5A, 250V	102370

## 7.0 TROUBLESHOOTING



**CAUTION:** Disconnect power to the controller before opening front panel!

Troubleshooting and repair of a malfunctioning controller should only be attempted by qualified personnel using caution to ensure safety and limit unnecessary further damage. Contact the factory.

### 7.1 Error Messages

#### **TEMP ERROR**

This error condition will stop both conductivity and pH control. It indicates that the temperature signal from the conductivity electrode is no longer valid. This prevents controlling based upon a false pH or conductivity reading.

	<b>Possible Cause</b>	<b>Corrective Action</b>
1.	Green or white electrode wire disconnected.	Reconnect.
2.	Faulty electrode.	Replace electrode. Revert to manual temperature compensation by cycling power off and on.

### ***SENSOR ERROR***

This error condition will stop conductivity control. It indicates that the conductivity signal from the electrode is no longer valid. This prevents controlling based upon a false conductivity reading.

	<b>Possible Cause</b>	<b>Corrective Action</b>
1.	Back or red electrode wire shorted.	Disconnect short.
2.	Faulty electrode.	Replace electrode.
3.	Faulty controller.	Verify via failed self test.

### ***HIGH ALARM***

The summary screen will display an H at the right end of the bar graph if the conductivity rises above the high conductivity alarm set point. If your unit is wired for alarm output, the alarm relay will trip. The controller will continue to check the conductivity, and the bleed and/or feed outputs will be allowed to be activated.

	<b>Possible Cause</b>	<b>Corrective Action</b>
1.	Dirty probe	Clean probe (see Sect. 6.1)
2.	Faulty solenoid valve	Repair or replace solenoid valve.
3.	Faulty probe	Evaluate (see Sect. 7.3). Check Temp display.
4.	Improper wiring of valve or controller	Correct wiring. See Section 3.4.
5.	Conductivity rose over alarm limit while biocide lockout occurred.	Allow normal bleed to occur.
6.	Clogged Y-strainer in bleed line	Clean Y-strainer.
7.	Faulty bleed relay	Replace relay. (Consult factory.)

### ***BLEED TIMEOUT***

This error condition will stop conductivity control. It is caused by the bleed output being activated for longer than the programmed Bleed Time Limit.

	<b>Possible Cause</b>	<b>Corrective Action</b>
1.	Programmed value too low for normal conditions.	Increase Bleed Time Limit.
2.	Bleed flow rate too low.	Check for clogged strainer. Check for insufficient pressure differential.
3.	Bleed valve not opening.	Check for faulty bleed valve. Check bleed valve wiring. Check controller relay.

## ***LOW ALARM***

The summary screen will display an L at the left end of the bar graph and the alarm relay will trip. The controller will continue to check the conductivity and feed inhibitor as programmed.

	<b>Possible Cause</b>	<b>Corrective Action</b>
1.	Sensor disconnected	Reconnect. Check cable for continuity.
2.	Sensor dry	Check tee for obstruction. Verify flow. Change location of probe.
3.	Pre-bleed set too low	Check pre-bleed setting compared to % low.
4.	Solenoid valve stuck open	Repair or replace solenoid valve. (Consult your distributor).
5.	Faulty probe	Evaluate (see Section 7.3). Replace if necessary.
6.	Improper wiring of probe	Correct wiring. See Section 3.4.
7.	Faulty bleed relay	Replace relay. (Consult factory.)

## ***NO FLOW***

This error message will appear if the flow/no flow switch closure is opened. The error message will be displayed and the alarm relay will trip. The conductivity is updated but all outputs are deactivated.

	<b>Possible Causes</b>	<b>Corrective Action</b>
1.	No flow	Check recirculating pump, valves, etc.
2.	Faulty flow switch/cable	Check for open circuit. Disconnect flow switch and short the input with a piece of wire. If "no flow" message disappears, then switch or cable may be faulty.
3.	Insufficient pressure drop through sample stream	Check piping.

## ***CAL FAIL***

The controller allows a maximum of  $\pm 50\%$  correction to the conductivity reading. This is a cumulative correction factor which means that if at one time the probe is calibrated by 30%, the next time it is calibrated it will only accept an adjustment of +20% before reporting a Cal Fail.

The most likely problem is that the probe needs to be cleaned. Refer to section 6.1.

## ***TimeErr:SetTime!***

This error message is triggered by corruption of the clock chip. Biocide additions will be locked out until the clock time is reset.

<b>Possible Cause</b>	<b>Corrective Action</b>
1. Power spikes, high frequency noise	If this occurs frequently, install a power line filter.

## **7.2 Conductivity Readout Does Not Change**

If the readout is stuck at or near zero:

<b>Possible Causes</b>	<b>Corrective Action</b>
1. Dry probe	Check for flow through system.
2. Probe is disconnected.	Check wiring to probe. Go to self-test menu, as described in section 5.2 If readout changes to 1000, the problem is with probe or connections. See section 7.3 If still at zero, problem is with controller. Consult the factory.

If the readout is stuck at another number:

<b>Possible Causes</b>	<b>Corrective Action</b>
1. Dirty or faulty probe	Evaluate probe (section 7.3).
2. Stagnant sample	Check system for proper flow.

### 7.3 Procedure for Evaluation of Conductivity Probe

Can be used for troubleshooting low conductivity, high conductivity, conductivity stuck at 0, and/or conductivity stuck at a number other than 0.

Try cleaning the probe first (refer to Sect. 6.1).

To find out if the probe or the controller is faulty, step through the Self-Test menu, as described in section 5.2. The display should read  $1000 \pm 20$ . This indicates that the controller is OK and the problem is in the probe or its connections. If the conductivity reading is not  $1000 \pm 20$ , return the control module for repair.

To check the probe, check the probe connections to the terminal strip (refer to Figure 3). Make sure that the correct colors go to the correct terminals, and that the connections are tight. Restore power and see if the conductivity is back to normal. If not, replace the probe.

## 8.0 SERVICE POLICY



The WCT series Cooling Tower Conductivity Controller has a 2-year warranty on electronic components and a 1-year warranty on mechanical parts (keypad, terminal strip and relays).

We stock circuit boards for immediate exchange after we have isolated the cause of the problem.

Factory authorized repairs that are received by next-day-air will be returned within 24 hours. Normal priority for returns is two weeks.

Out of warranty repairs or circuit board exchanges are done on a flat fee basis after the warranty is expired.

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